

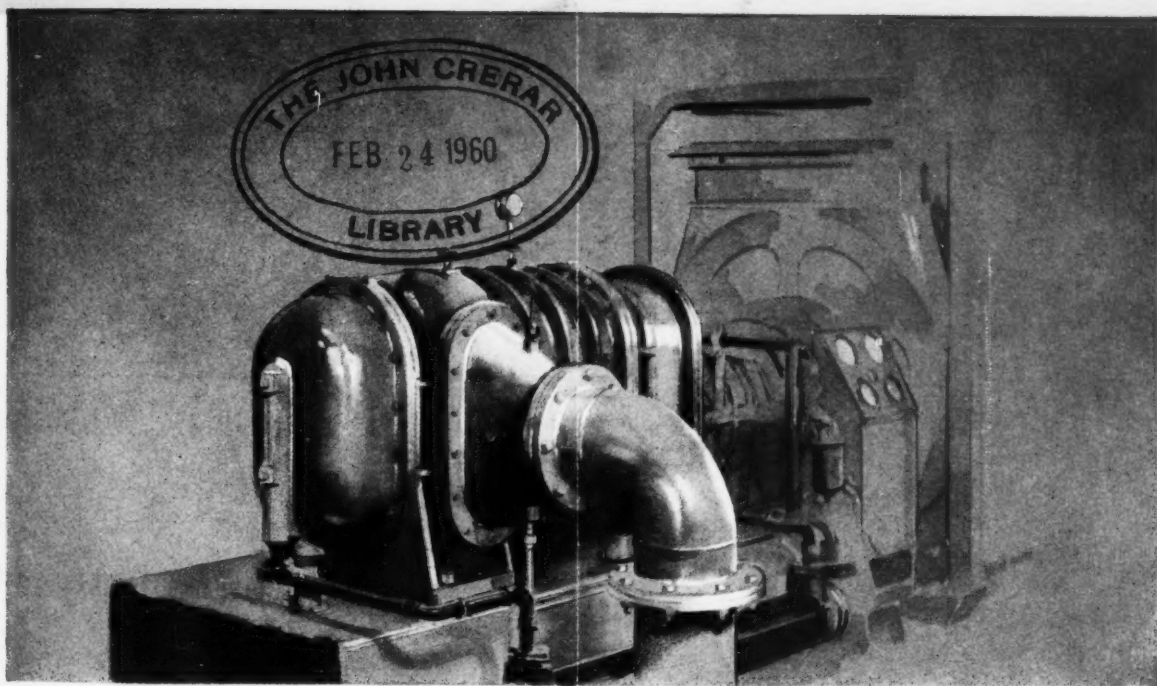
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The Mining Journal

LONDON, JANUARY 29, 1960

Vol. 254, No. 6493.

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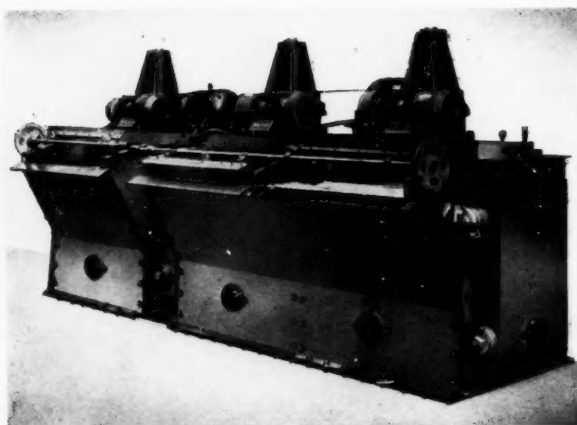
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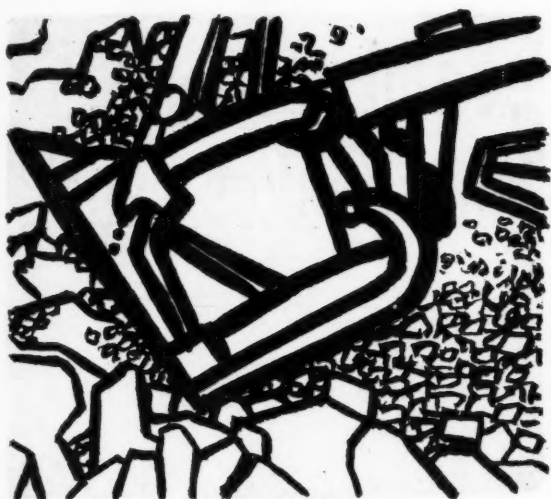
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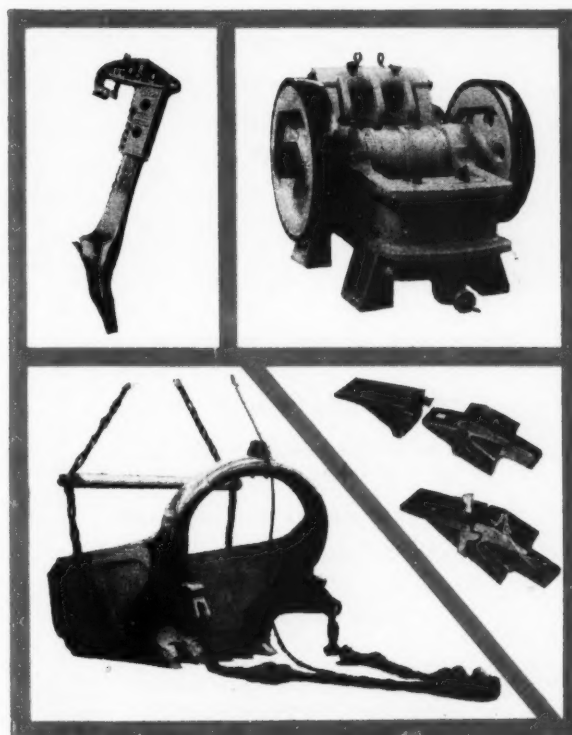
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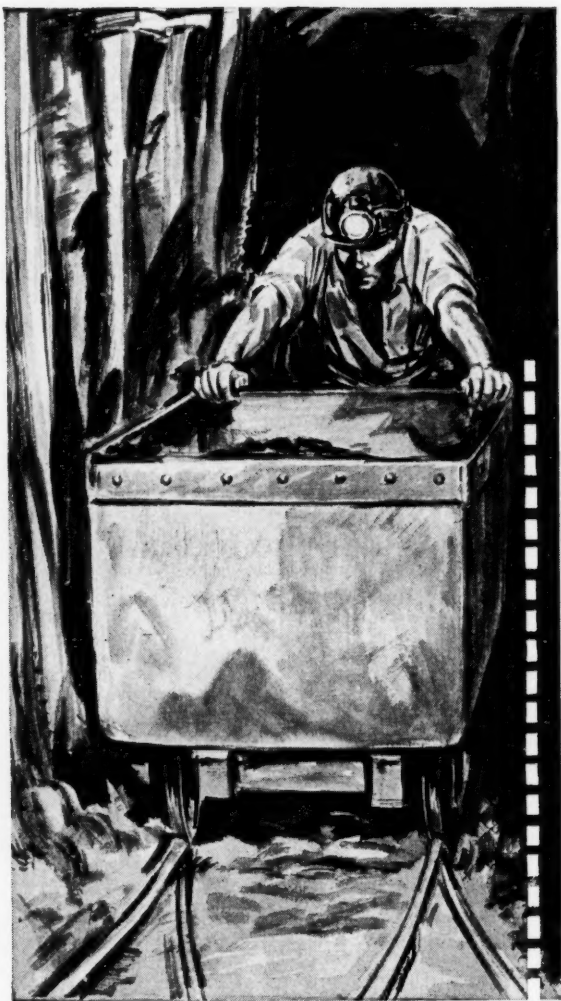


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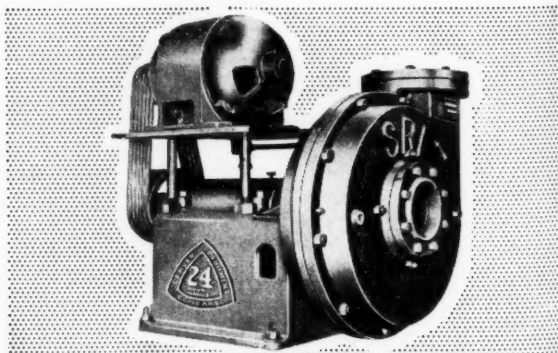
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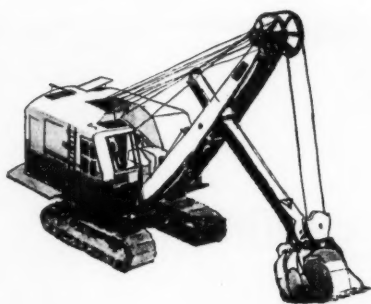


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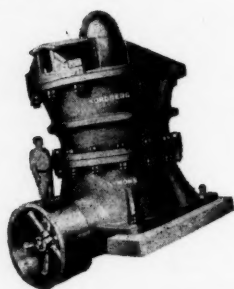
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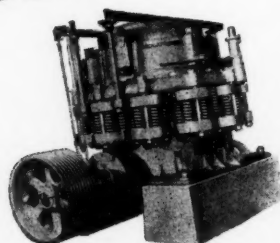
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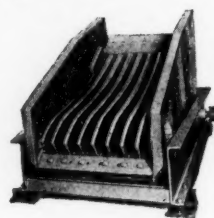
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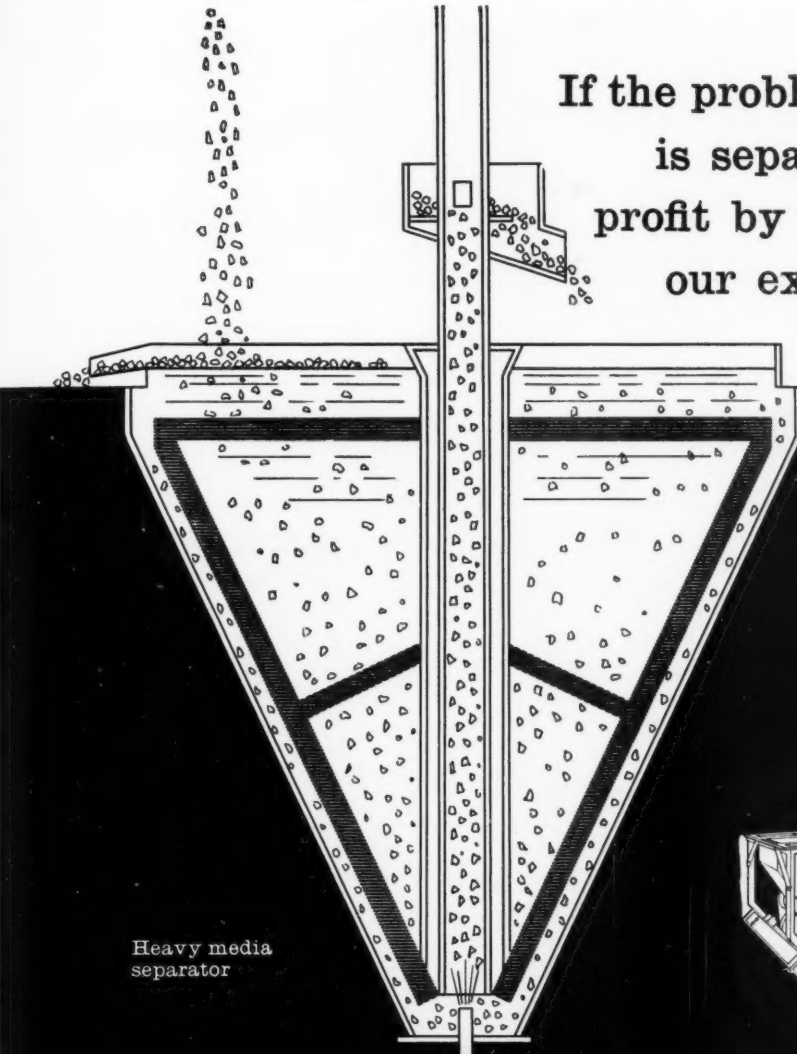
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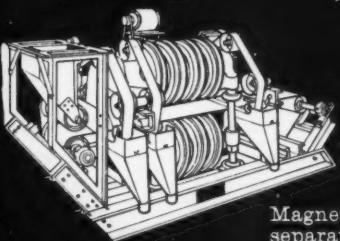
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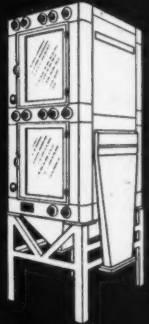
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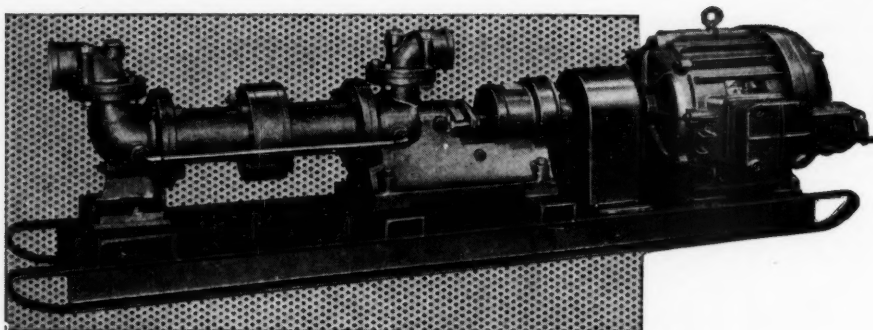
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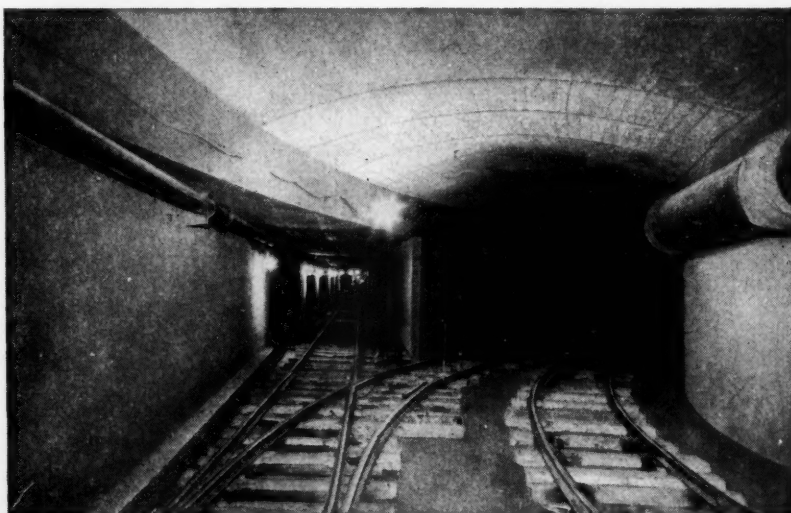
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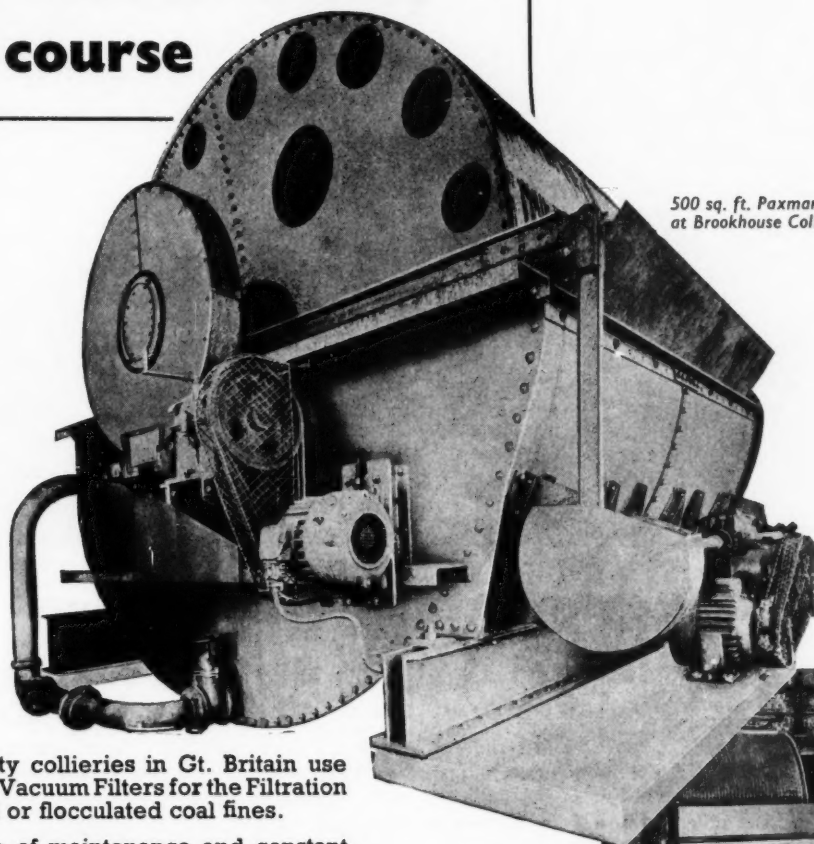
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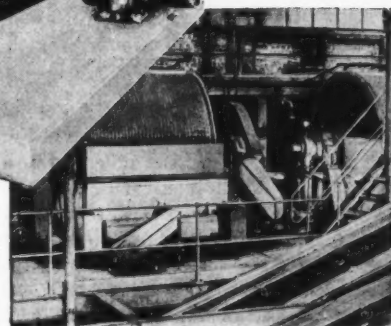
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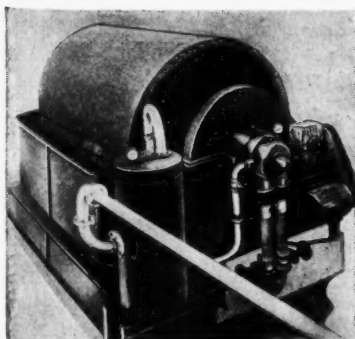
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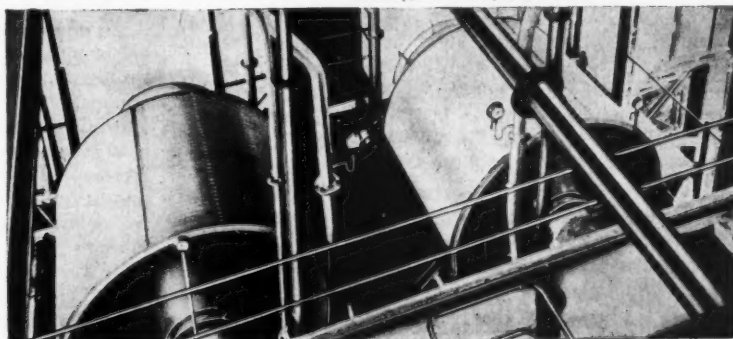
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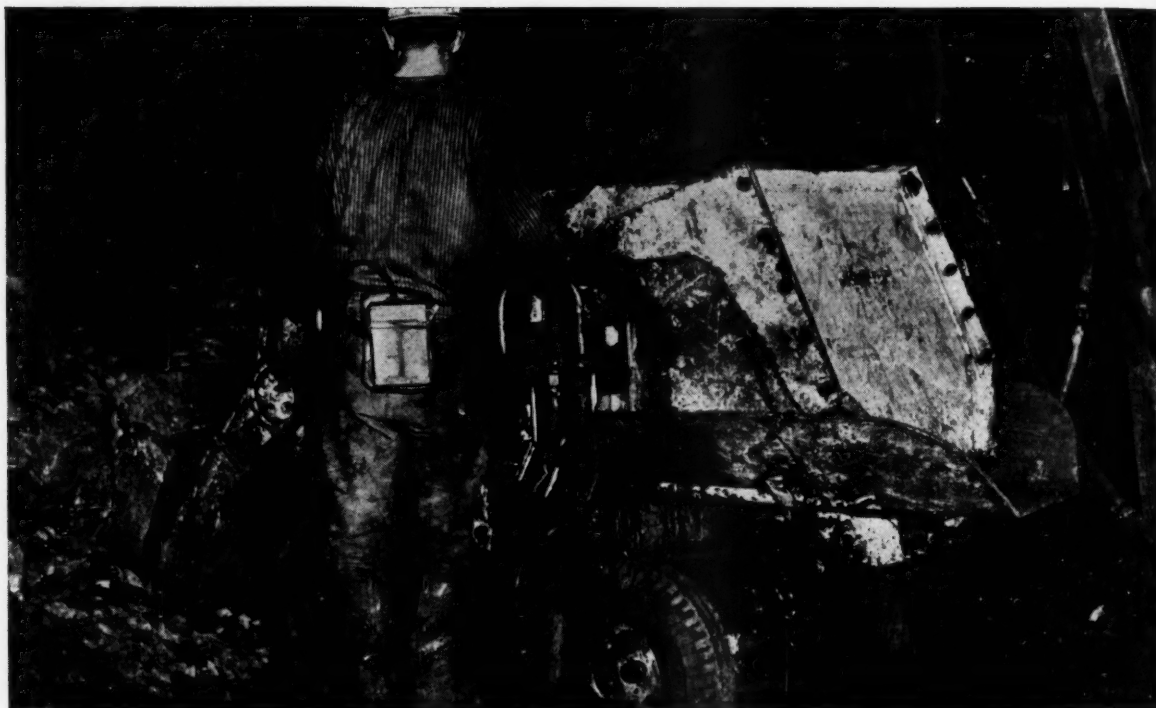


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Atlas Copco Auto-Loader raises output, lowers costs in German coal mine

150% increase in drifting capacity

Germany's chief mineral asset is coal. In fact the rich German coal fields are among the most important in Europe. One of the leading mines west of the Rhine is Pattberg, which in 1958 produced almost 2 million metric tons of consumable coal. Despite the use of up-to-date methods and some of the most modern mining equipment available, Pattberg is faced with two of the current problems confronting the industry:—

- The urgent need to cut production costs to a minimum—due to the increasing competition for markets.
- The growing necessity to eliminate heavy physical labour—reflecting the rising living standards of mine-workers.

Engineers at Pattberg have found that mechanised loading is helping them to solve both problems. The original drifting capacity was 0.44 metres per man-shift. Now, by progressive improvements in loading technique, this has been raised to 1.16 metres—an increase of more than 150%. Their superiority to any similar machines having been proved by stringent tests, Atlas Copco T2GH Auto-Loaders are now in extensive use in the Pattberg mine.

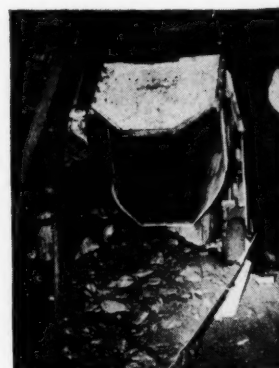
A two-man team carries out the complete drifting operation—drilling, blasting, loading and timbering. While one miner is loading, the other prepares for timbering. The figures in the table refer to drifting in a cross-cut with an area of about 10m² where the average advance is about 2.5

metres a round. Statistics show the average time schedule for a team on an eight hour shift to be:—

		% of effective working time (excluding breaks)
drilling	95.5 minutes	26.7
charging and stemming	51 "	14.4
loading and sundry work	100.5 "	28.3
timbering	109 "	30.6
	356 minutes	100%

The Auto-Loader tips onto an armoured conveyor which is extended once a week. Haulage distance, thus, varies between 10 and 30 metres.

Atlas Copco Auto Loaders are being used successfully throughout the world for applications for such as cut-and-fill stoping and sub-level caving in ore mines, cross-cut drifting in coal mines and loading operations on the surface. Perhaps they could help improve capacity at your mine? Contact your local Atlas Copco company or agent or write to one of the addresses below:



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The Mining Journal

London, January 29, 1960

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The Future of Canadian Uranium

THE first Canadian Conference on Uranium and Atomic Energy, held in Toronto early in January this year, brought cold comfort to producers so far as the medium-term future is concerned. As usually happens when mineral producers are faced with the transition from a buyers' market to a position of over-supply, the clouds have been steadily darkening with each new assessment of the situation.

Until quite recently there seemed to be a broad measure of agreement among those best qualified to judge that the difficult period for uranium would be the interval between the lapsing of Government contracts in 1962 and 1963 and the end of the present decade, the assumption being that by 1970, at latest, the nuclear market would have risen sufficiently to bring demand fully into balance with supply. From estimates presented to the Conference, it would appear that this forecast may prove to have been over-optimistic.

According to Mr. W. M. Gilchrist, president of Eldorado Mining and Refining Ltd., the Crown corporation, which negotiated the Canadian defence contracts with the C.D.A., the world's proved ability to produce uranium might exceed estimated requirements until the late 1960's or early 1970's, even if military requirements remained at the existing level. If military demand dropped, the situation of over-supply might continue well into the 1970's. Mr. Gilchrist considered that the weight of opinion was on the side of a reduction.

These views were supported by Mr. Philip Mullenbach of Chicago, vice-president of Growth Industry Shares, who added that the growth of civilian demand was likely to be considerably slower than had been anticipated earlier. Referring to a report published by Atomic Energy of Canada Ltd. last July, in which it was predicted that requirements of natural uranium for civilian demand would rise to 30,360 tons annually by 1970, he suggested that this figure should be reduced by one-third, since the Euratom power programme had already fallen behind expectations of a year ago as a result of an improved oil supply.

Uranium is by no means the only fuel to be in difficulties at the present time, as witness the large number of capped oil and gas wells in Canada itself, as well as the coal stocks piling up in Western Europe.

However, as the president of the Institution of Mining Engineers recalls in a paper summarized elsewhere in this issue, this is not the first time that the coal industry in Britain has been faced with a downturn in home demand, nor are these setbacks confined to fuels. So far as uranium is concerned, any tendency on the part of the Canadian industry to view their medium-term prospects through rose-coloured spectacles would appear to have been conclusively dispelled, for the latest appraisals of the situation can scarcely be accused of any lack of realism. Barring any unforeseen contingencies, the future is hardly likely to be any darker than the picture which is now being painted, and there has been no suggestion from any quarter that the long-term outlook is anything but bright.

Inevitably there will be attempts to make political capital out of the present muddle, but for uranium producers in Canada and elsewhere the most important consideration is not to apportion the blame for a situation that should never have been allowed to develop, but to explore ways and means of minimizing the consequences. The Conference at Toronto brought together a wide and varied group of people associated with the industry in one way or another, including scientists, engineers, economists, company directors, miners, prospectors, politicians and Government officials. The overall objective was to correlate and assess current planning of the new industry and the deliberations appear to have been both realistic and constructive.

It is evident that the so-called "stretch-out" arrangements for Canadian contracts can bring only limited assistance to producers in weathering the critical years, however valuable they may be in strengthening the position of a few major producers and mitigating the hardships of the few who are not in a position to fulfil existing contracts. Dr. D. R. Derry, vice-president of the Rio Tinto Mining Company of Canada, suggested that a start on the solution to the mines' problems would be for Eldorado to distribute its supply contracts among the successful private operators, the Government-owned mines being held as a strategic reserve. The fortunes of producers would appear, however, to depend primarily on the ability of individual companies to sell their product in the highly competitive conditions which must be anticipated in the years ahead.

Mr. Mullenbach expressed the opinion that there was some chance of winning further supply contracts in the United States. If Canadian producers could supply uranium as cheaply as U.S. mines, then a basis for negotiated modifications of the present A.E.C. policy might exist. He also referred to prospects of a small but valuable market for Canadian uranium in Japan and other Free World countries.

It was contended, however, by Mr. A. F. Lowell, head of the marketing department of the Rio Tinto Mining Company of Canada Ltd., that world trade in uranium was being throttled by Government restrictions based on a useless concern for the end-purpose of nuclear raw material. Mr. Lowell pointed out that the present system allowed only token amounts of uranium—a total of 2,500 lb.—to be sold to countries that did not have a bilateral agreement with Canada. To purchase commercial quantities, countries must sign an agreement to provide Canada with a full accounting of what they did with the uranium, and permit Canadian inspectors to examine their nuclear atomic installations for verification. Quite a number of countries, it was stated, object to concluding such agreements, which are regarded as infringements of national sovereignty.

Although this view was challenged by Mr. Gilchrist, head of Eldorado, it is difficult to see what good purpose could be served by continuing these restrictions at a time when uranium is in surplus supply and few countries are likely to have much difficulty in obtaining their requirements, for whatever purpose, from one source or another. In view of Canada's urgent need to develop new markets, it would be surprising if the Canadian Government is not sooner or later converted to the view that the present restrictions should be relaxed.

Some encouragement was afforded by the assurance given to the Conference by Mr. Lorne Gray, president of Atomic Energy of Canada Ltd., that Canada itself would provide the domestic uranium industry with an assured market for an average of \$34,000,000 worth of nuclear products annually during the next five years—a figure rather larger than manufacturers had expected.

One of the most interesting proposals put forward was that the uranium mining industry should set up a fund of not less than \$500,000 for research into new uses for uranium. Hitherto uranium's most common applications outside the nuclear field have been in imparting yellow and brown tints

to glass and to glazes on pottery, in the production of iridescent glass, and as a mordant in dyeing silk and wool. Certain uranium compounds are employed in chemistry, photography and medicine. Uranium has also been used in the production of steel alloys, the scope for which, in the past, has been limited by cost. Now that it is available in quantity and at a price which makes it competitive, it would be surprising if new outlets could not be developed. One result of tests by Eldorado has been an indication that uranium added to steel makes the metal more rust-resistant.

Indicative of the success of the first Canadian uranium conference was the announcement that a permanent forum for the exchange of ideas and information between the various sections of the atomic industry had been set up, and a full-scale conference would probably be held every year.

URANIUM IN S.W. ENGLAND

The reconnaissance survey for uranium, carried out by the Atomic Energy Division of the Geological Survey in the last two years, is now virtually complete.

Seventy new occurrences of uranium have been found during the course of operations which have included an aerial survey of Cornwall, Devon and much of Somerset, as well as surface mapping, excavating and drilling at promising localities. No deposit of economic importance has been discovered and it is concluded that if any are present, they are covered to such a depth with soil or overburden that they are unlikely to be detected by existing instruments.

Although no deposit estimated to contain more than 5 tons of uranium oxide has been found as a result of this survey, the Department points out that the S.W. of England uranium province has served for many years as an ideal testing ground for British geological electronic equipment, which is now used extensively throughout the world.

The study of uranium occurrences in Cornwall and Devon, started in 1945, has played an important part in the discovery of uranium in the Commonwealth, while recent work has contributed considerably to the development of aeroradiometric survey techniques. A scientific assessment of the aerial survey technique, read at the 1958 Geneva conference on the Peaceful Uses of Atomic Energy, has been acclaimed as one of the more important papers presented at these meetings. Thus it can be said, that although no important reserve of ore has been proved in the S.W. province, the work undertaken has been fully justified.

STATESMANSHIP IN GHANA

In marked contrast with some of the more violent statements emanating from Ghana is the moderation and realism consistently being shown by the Government in promoting the industrial and commercial expansion of the country. Ghana's economic policy is clearly based on a far-sighted appreciation of the importance of overseas capital to the country's development, as indeed was explicitly underlined in the Second Development Plan 1959/64.

Positive steps have been taken to attract expatriate capital. In the first place, Pioneer Industry Legislation has been enacted and many United Kingdom interests have already taken advantage of this concession. Repatriation of overseas capital has been guaranteed, and an Investment Promotion Board has been set-up for the sole purpose of assisting prospective investors and of reviewing investment inducements.

The gold mining industry, in particular, has consistently benefited from the Government's sympathetic and practical understanding of its problems, the most recent example of which is the interest-free advance to Amalgamated Banket Areas of £150,000 for three years starting on October 1 last,

making £450,000 in all (*vide The Mining Journal*, Jan. 15, p. 74). The extremely generous terms on which this assistance has been granted should be a valuable contribution towards the creation of a favourable climate for expatriate capital. Having regard to the small amount of development capital at the Ghana Government's disposal, the fact that such a substantial advance is being made to a single mine is a notable reflection of the intention to put mining on a high priority, even though the mine in question is in the Tarkwa district and its closing down might well have endangered the general development project for the area.

There is clearly no inconsistency between the Government's positive and commendable measures to attract the new capital necessary for the various development projects on which it has set its heart, and its desire that in the new industries established there should be an element of private Ghana shareholding, which is an understandable and healthy aim.

In line with its policy of ensuring that future expansion is channelled along sound financial lines, the Government of Ghana recently began discussions with representatives of the London Stock Exchange with the aim of setting up a Stock Exchange in Ghana. This is a logical development which is to be expected sooner or later, though it might well be later rather than sooner. We have no doubt that the British overseas mining industry, which has been so fairly treated to say the least, will not be backward in giving local stock exchange operations every assistance in its power.

PORTUGUESE MINING DEVELOPMENT

At present a large-scale development programme of the minerals mining and processing industries is being carried out in Portugal and its colonies. This is part of the long-term industrial expansion plan started last year and with 1964 as its target. A build-up of production and exploitation potential through the construction of new plants and the modernization and expansion of old installations is to be backed up by an increase in scientific research into mining technique, into the question of the industrial utilization of indigenous ores and into the improvement of present conditions. This work is already well under way and will have brought about satisfying results by the target year. Accompanying all developments is the drawing up of a geological map of the country, work on which is being speeded up.

Well in the forefront of the country's aims in this field is a satisfactory development of the iron ore industry. This will feel the results in the first instance of a complete reorganization of the mineral mining industry, in which improved technical and economic conditions of operation will help to protect Portugal from, to quote a recent Portuguese Government report, the vicissitudes of international price rates. Iron ore reserves in the Moncorvo will be explored in detail, a picture made of their economic potential and the ores used for iron-smelting purposes, Krupp-Renn furnaces to be installed to this end. The Marão ore deposits and the Vila Cova iron-smelting industry are also subjects for study in the plan.

Electrical iron-smelting ranks high on the list of importance and is one of the main reasons for the expansion of the country's electrical power supply now being attended to. This branch of the Portuguese mining industry is tied up closely with plans for a national heavy industrial set-up, and by the end of the current year a steel works complete with rolling mill and coke reduction plant will have been built at Seixas, on the banks of the Tagus; this plant will have an ultimate annual output of 200,000 tonnes of rolled steel. Next year, with the start of the second phase in the ferrous metals development plan, installation of ore reduction equipment will begin in the north of the country for the annual production of 150,000 tonnes of pig-iron. The annual rolled steel output of 200,000 tonnes will be raised to one of 300,000

tonnes, and coking and other subsidiary plants built up. Total investment is given as 2,800 million escudos, or £35 million.

The coal industry is to be expanded as its end-products will be needed both for coking purposes and for the production of more electrical power, not all of which increase by any means being able to be obtained from the Portuguese hydro-electric centres. Exploration for coal and anthracite is being made; as far as is possible, Portugal hopes to use indigenous fuel for the electrical power industry.

Apart from the continued search for other essential ores, including copper, and for oil, uranium is being searched for further and is planned to be exploited. This exploitation will be carried out by the national Nuclear Energy Board, which also looks after exploration in this field. A plant is planned to be erected for the production of 200 tonnes of metallic uranium per year.

The Portuguese colony of Angola has been much in the news recently for its mineral exploitation scheme. Under the 1959-1964 Plan the spending of 30,000,000 escudos (some £375,000) is provided for. The Government itself is not directly interested in the production of aluminium in the colony nor the connected build-up of an electrical power network on the river Quanza, both these projects being the concern of private interests.

In Portuguese India, where mining has become ever more important of late, the Lisbon authorities are more interested. Here they are to spend money provided for by the plan for geological and mining prospecting and on the erection of a full-scale mining laboratory.

SOMALILAND'S SEARCH FOR MINERALS

During the year there were no private mining or prospecting operators in the Somaliland Protectorate, other than oil companies, states the Geological Survey Department in its report for the year ended March 31, 1959, although a number of enquiries have been received concerning economic minerals. It has, therefore, been imperative that the Department should press on with the search for economic mineral deposits and undertake prospecting operations, while at the same time continuing more detailed systematic mapping. For these purposes a drilling contract was placed and a sub-surface sampling of the high-grade gypsum anhydrite deposit of Suria Malaleh was undertaken by three 300-foot coreholes. A mineralized fault-breccia carrying small amounts of galena and copper ore in the Berbera District was also drilled by four shallow coreholes but unfortunately no significant amounts of ore were encountered when the zone was intersected.

In the course of map revision in Borama District an interesting area of mineralization was brought to light south of Qabri Bahr. Pegmatites were found to carry local concentrations of beryl and columbite. A number of veins were pitted and trenched revealing scattered large crystals of beryl and local pockets of columbite associated with quartz cores. A visit was paid to the Protectorate by an officer of the Geological Survey of Great Britain, Atomic Energy Division, who spent two months assessing the Qabri Bahr area and also the beryl-bearing pegmatites of the Humbeleh Range near Laferug in Berbera District.

A very narrow zone of copper mineralization about 24 miles from Hargeisa was systematically prospected but appeared to be too small to merit special interest. Corundum-spinel and corundum-iron ore (emery) concentrations were also mapped. A mass of nepheline syenite in Borama District was found to contain traces of a radioactive mineral, provisionally identified as pyrochlore, and of molybdenite and is probably the product of a carbonatite-type vulcanicity. New mineral occurrences of kyanite, apatite, bismutite, betafite, talc and radioactive zircon were recorded.

FLEXIBILITY IN THE COALMINING INDUSTRY

FOR his presidential address to the Institution of Mining Engineers on Thursday, 28th January, 1960, Mr. R. G. Baker, C.B.E., B.Eng.(Min.) took as his subject "Flexibility in the Coal Mining Industry".

For a long time, he pointed out, all the coal-mining industry's attention has been directed to securing an increased bulk output. Not only was this so in respect of day-to-day operations in the pit, but also forward planning was directed to the same end. With this singleness of objective, it was natural that mining engineers should have become rather set in their ways and outlook. However, this very singleness of objective itself was really the outcome of a lack of flexibility in the industry, made manifest by the inability to raise output as rapidly as was required.

There were a number of reasons why an output buoyancy could not be had, one being that new pits could not just be built like new factories on some favourable site. Mining engineers had to content themselves almost exclusively with the upgrading and the uprating in capacity of existing collieries.

The reversal in demand for coal and, in particular, the rate and duration of the decline in demand, again found the industry with insufficient flexibility to keep pace with the changing situation. This time the effects were most noticeable within the industry itself, whereas when failing to meet a rising demand it was the consumer who felt it most.

After noting that the 25,000,000 tons rise in consumption for the eight years 1948-1956 had been wiped out in the last 2½ years, Mr. Baker recalled that the industry had to face a similar rate of falling home demand in the years 1930, 1931 and 1932. A significant difference between today and the 1930's was that then the industry found the necessary flexibility to deal with a falling demand mainly out of short-time working and unemployment. Coal stocking was used only to a very limited extent.

Recruitment and Stocking

While times were very difficult for colliery companies and their shareholders, the impact of the exercise of flexibility in the 1930's was most hard and personal on the employees in the industry. At the present time the National Coal Board has shown a determination to go to great lengths to avoid, so far as possible, any widespread repetition of the sufferings of those earlier years.

If short-time working is to be avoided, it means that, in a falling market, flexibility is reduced and is largely limited to that which can be had from natural wastage in the numbers of men employed. "However", said Mr. Baker, "we must not limit our considerations solely to a declining market. This would be a new one-track outlook; we must be ready for a cessation and even reversal in the downward trend".

If variations in manpower, and consequently variations in output, are to be produced by control of recruitment alone, there is bound to be a limiting rate at which any change can be brought about. Furthermore, once restriction of recruitment has been put into operation, its effects are unlikely to be checked and reversed immediately recruitment policy is reversed.

Stocking or unstocking of coal can help to bridge the difference between supply and demand but, like the storage

of anything else, it has its limits, arising out of both physical and financial considerations. Recent experience has shown how far stocking can go when a change in demand is not followed fairly promptly by a change in supply. If we are to try to avoid excessive stocking and also harsher measures than restriction of recruitment as a means of giving the flexibility to enable supply to follow a falling demand, and if we are to have any chance of meeting a rising demand by full recruitment before flexibility from stocking is exhausted, we must accept the consequences of control of recruitment being a delayed-action measure with limited and unpredictable rates of operation. This, in Mr. Baker's view, means that the rate of recruitment should be varied as soon as ever a new trend becomes discernible, without waiting until the new level of demand has become fully established.

Commercial Aspects of Mining Engineering

Until the last year or two there has been no need to stimulate demand. Now, of course, the industry has to move in the opposite direction. The National Coal Board is doing much to stimulate demand. Mr. Baker emphasised, however, that it was not sufficient to advertise, to call on people and build up personal sales contacts, or to offer technical advice or service. Permanent business could only be had by giving the customer what he wanted.

Competition is not new. The paper recalled that in the 1930's there was keen competition between units within the industry. Coal was mined and prepared with the utmost care, for the reason that, from the highest official to the most junior mineworker, everyone knew that coal not to a customer's liking would not sell and coal which would not sell would not be mined and, in turn, if coal was not mined men did not work. These circumstances are just as compelling now, but stocking of coal for which there is no immediate market has tended to obscure this issue. In this connection Mr. Baker wondered whether mining engineers, particularly at lower levels, had become too much mining engineers and too little commercially minded; not by their own volition but by force of circumstances. He believed that they should have a big interest and a big part to play in the saleability and the actual destination of their coal. This should be recognised and their interest must be encouraged and completely re-established, so that they, in turn, would stimulate the interest and concern of all people at the collieries.

The production of coal suitable for a particular purpose with a satisfactory degree of consistency might not be easy of achievement, it was pointed out, and success or failure is tied up very much with the mining situation at individual collieries. Coal *in situ* is far from being a homogeneous material; it varies from band to band within a seam; it may be interspersed with dirt bands, and seams vary within the confines of a single pit. Where two seams having different characteristics are worked in a pit, the choice may be between winding and preparing them separately to give a fair chance of producing consistent saleable products, or winding and preparing them mixed, giving a product lacking in uniformity.

The actual working of a seam can have considerable bearing on the properties of the product. For instance: should a seam be cut at the horizon which is best for its

easy working, or should a cut be made at some less preferable horizon to remove an unwanted band of dirt or inferior coal? Should faces be worked on bord or end? Should gummings be filled out as run-of-mine coal, filled separately or gobbed? Should certain seams be worked at all? What should be the balance of output from those seams which are worked? What power-loading machines should be used?

These are all very much mining matters, varying from pit to pit and from seam to seam and all subject to a change of emphasis in present circumstances. In the end, the mining engineer will have to decide what is possible and what the result may be; the best answer will not be forthcoming unless it is based on a balanced knowledge of all the factors.

In times of over-demand, the almost overwhelming supply factor is bulk output, whilst customer preference cannot be a dominant feature. Now, with a demand which needs stimulating, customers' needs and preferences become a very live issue.

Most of the well-known properties of coal are inherent in the coal seam, but by mining methods, by seam selection and by subsequent cleaning processes, we have the means whereby some variation of the properties of coal as supplied to the customer can be achieved. Subsequent cleaning processes, it was emphasized, cannot do everything.

The suggestion was made that, even though there was much that was different between coal production and manufacturing industry, the coal industry might do well in going some way in emulating the closer contact between producer and consumer which the manufacturer finds to be necessary.

Coal Processing

The paper went on to consider the subject of coal processing to give products having different physical and chemical properties. It was noted that the proportion of coal carbonization carried out by the coal-mining industry itself had steadily decreased over the years. The explanation for this presents no difficulty, but it is in sharp contrast with the common practice found with most other mining, where almost always mining and processing form integral and complementary parts of the same undertaking. Integration of complementary activities has also gone on to a great extent in the majority of unnationalized big business. However, our nationalization in some cases resulted in a move in the opposite direction, inasmuch as it severed collieries from some of the coke ovens and all the steel works which had previously been under common ownership.

It may be that coal mines attached to an integrated undertaking would not, in themselves, enjoy any special advantages, but it seems more than likely that the flexibility of the undertaking as a whole is greater than that which can be enjoyed by a coal-mining industry standing virtually on its own.

Mr. Baker made it clear that he was not looking backwards with any nostalgic longing for the past, nor was he advocating that the Coal Board should go in for such activities as the manufacture of engineering products on a big scale. He did submit, however, that coal processing, either by carbonization or by other treatment, was properly complementary to coal mining and that the coal-mining industry must see that it had a full share in any new developments.

The economics of coal processing were then discussed and the view was expressed that the chemical market, in terms of tonnage, was unlikely to be more than a fraction of the fuel market for many years to come.

Reference was also made to the fact that the generation of electricity by the Central Electricity Generating Board from coal-fired stations was to increase. While this was good news, the "processing" would not be in the hands of the coal-mining industry. If coals with a reliable low ash content were to be prepared for processing to premium fuels or as a

raw material for chemical manufacture and if, at the same time, the discard was to have an acceptably low content of combustible, it seemed inevitable that a middling must be extracted and that the unavoidable irregularities in the raw coal feed to the washery would be reflected and even concentrated in the middling fraction. British coals had seldom required the complete extraction of a middling, but new processing was likely to call for much cleaner coals, and an extracted middling was more than a possibility.

Planning for Flexibility

Reverting to more purely mining considerations, it was suggested that some thought might usefully be given as to whether anything could be done in the planning, equipping and working of collieries to give greater inherent flexibility. We have to think very seriously whether mining layout and equipment can any longer be such that where two or more seams of differing characteristics are being mined, the coal is inevitably either wound or prepared as a mixture. Such a mixture may be tolerable under one set of market conditions and yet unacceptable at other times. It may reach the point where the output from a particular seam becomes unacceptable altogether. Thus we may have to abandon to some extent the orderly extraction of seams which has grown up as good mining practice over the last few years. Block winding may be the answer and, even if this is not currently required, pit-bottom layouts should be such that sufficient standage for block winding can be had at a later date. The same considerations will have some bearing on whether trunk conveying of coal from more than one seam to the pit bottom should be used.

The marginally-acceptable seam needs special consideration. It should be recognized that the working of such seams may stop and after a few years restart. Fortunately, most of our equipment underground is of a portable or semi-portable character, so that its recovery without loss, other than the cost of removal, is relatively easy; thus there is no case for a marginal seam being equipped in a sub-standard fashion, nor would there be any justification for lowering the standards of roadways since the size of a roadway in the ultimate is usually determined by the quantity of ventilation which it has to pass. However, the provision of a costly pit bottom would be a less certain proposition in the marginal seam where a less expensive layout, though more extravagant in labour, might be the more rational investment. As regards the layout of faces, it would seem desirable to achieve the maximum concentration of working in an area.

The ability to adopt the technique of fast-moving power-loaded longwall faces more widely, would place in our hands a most valuable tool for achieving flexibility in output as between seams. It would, of course, also help to keep the area of working highly concentrated in a marginal seam.

Mobility of manpower is absolutely imperative if there is to be any flexibility in the working of the collieries. There is no escape from the fact that mobility of manpower is the only alternative to short-time working and/or unemployment.

It is no good contemplating flexibility of output underground without considering whether the coal preparation plant has an equivalent flexibility. It is unfortunately far too expensive, when putting down a coal washery, to provide for all the variations which may be called for over a period of years. Often it is the nature of the building or the proximity of the building to other structures which renders the modification difficult. With this in mind, Mr. Baker suggested that washeries should, if possible, be placed a little away from other buildings, and that the steel-framed building should be looked upon more favourably. He added that one firm had produced a "packaged" heavy washery, which would seem to offer advantages where there was an element of impermanence.

CHEMICAL GROUT AND ITS APPLICATION IN UNDERGROUND MINE WORKINGS

IN virtually any mining operation, including open pit or stripping operations, ground water infiltration may cause problems ranging in severity from mere nuisance to necessity for shutdown. These problems may occur in all phases of the operation, from the exploratory borings, to the actual stoping of ore.

The first decision to be made is whether to remove the incoming water entirely by pumping, or whether to shut off all or a portion of it. Generally, water volumes will accumulate as mining progresses, so that in most cases it will become necessary to shut off some of the infiltration by grouting. In the past, the great majority of all grouting work has been done with portland cement. In the last several years, considerable development work has been done with a new material, AM-9 chemical grout.

Properties of AM-9

AM-9 is a water soluble mixture of two organic chemicals, acrylamide and N,N' -methylenebisacrylamide, in proportions that can be made to polymerize to stiff gels from dilute aqueous solutions. Catalysts, ammonium persulphate (AP) and β -dimethylaminopropionitrile (DMAPN) are used to initiate and control the polymerization process.

AM-9 solutions will gel in concentrations as low as 3 per cent (by weight) and as high as the solubility limit (about 50 per cent). Most field work has been done with concentrations of 7 to 15 per cent. The characteristics of the reaction of a catalyzed solution are such that the viscosity and density (essentially the same as clear water) remain unchanged until gelation occurs. When gelation does occur, it is virtually instantaneous for short induction periods. The induction period, the time lapse between addition of catalysts and formation of a gel, can be closely regulated by varying the catalyst concentration, by controlling the temperature, or by addition of chemicals such as potassium ferricyanide which act as inhibitors. Control is also possible by varying the pH of the solution. With characteristics such as those described, AM-9 solution can be pumped anywhere that water will flow; although in zones of very low permeability, somewhat higher pressures may be required.

Pumping Equipment

From the previous description, it is obvious that AM-9 and catalysts may be mixed together and placed with any kind of a pump. This has been called the batch system, and such systems were used extensively at the start of American Cyanamid's field research programme. Batch systems have three major limitations:

1. The entire batch must be placed within the established induction period. This is not always possible since pumping rates often decrease as pumping continues. Thus the danger of gelation in the equipment is always present;
2. It is difficult to vary the induction period during pumping of a batch. For some applications, economy and varying water conditions necessitate changing the induction period;
3. The most severe limitation is that, because of its nature, it is not possible to use a batch system with very short induction periods. Very short gel times are essential when placing AM-9 in zones where water is flowing.

All the limitations of the batch system are overcome by what American Cyanamid terms a metering system. Basically this system consists of two pumps. The larger pump is used with a solution of AM-9 and DMAPN. The smaller pump handles a concentrated AP solution. Both pumps can be connected to a common drive, so that pumping volumes can be regulated without changing the volume ratio between pumps. In addition, the output of the AP pump can be changed during pumping. Control of gel time within limits is accomplished solely by varying the relative amount of AP being pumped. The two solutions are pumped through separate hoses and mixed at a "Y" at the point of injection.

AM-9 pumping operations are generally very rapid compared to grouting with cement. For this reason, lightweight equipment that can be easily moved around is desirable.

The metering system has a maximum pressure of 250 p.s.i. and a maximum volume of 13 g.p.m. It is notable that with this system the hoses from the pumps can be several hundred feet long, and the on-off control for the pumps can be placed right at the injection point.

Tanks to handle the two solutions can be almost any size or shape. For continuous operation, dual tanks are advantageous. While pumping from the bottom tank, fresh solution can be mixed in the upper tank, thus affording continuous operation without the necessity of mixing large quantities at one time. Materials of construction used for the tanks must be chosen carefully due to the corrosive nature of the concentrated AP solution. Corrosion ceases to be a problem after the two solutions are mixed.

Applications in Mine Waterproofing

The applications for which AM-9 has been successfully used in mining operations can be divided into three categories. These can be further subdivided as shown below.

1. Drill holes—
 - a. recovery of lost circulation;
 - b. sealing off inflowing water;
 - c. correction of caving conditions—drilling without casing.
2. Corrective measures for existing seepage.
3. Preventive measures for anticipated seepage—
 - a. localized areas;
 - b. large areas.

All of these applications can be made with pumping equipment such as previously described. Naturally, however, the pressures must be taken into consideration.

Sealing of Drill Holes

Work in drill holes represents the simplest application from the point of view of techniques involved. Chemical quantities required are generally very small. Drill holes in rock may be worked through a wall packer, or the solution may be pumped through the drill rods.

Abstracted from a paper by R. H. Karol, Soils Engineering Research Group, American Cyanamid Co., presented at the National Western Mining Conference, Denver, Colorado, February 1959

Sealing off water flowing into a drill hole may be necessary if the flow is strong enough to interfere with normal drilling procedures. The technique for this problem is similar to that described, except for the fact that a seal must be provided between the drill rods and the wall of the hole. The amount of solution needed will vary with the length of the fractured zone feeding the hole. Sealing of drill holes has been successfully demonstrated in the Greyhawk and Campbell-Chibougamau mines in Canada.

AM-9 has been used successfully to prevent caving and permit drilling in granular materials without the use of casing. For such applications the economics must be carefully considered. Much of the development work in this phase of grouting was done in iron ore deposits in Labrador. The problem here was that in exploratory drilling, the deposits often extended deeper than the extent to which the reduced casing could be driven. To reach the bottom of the deposit, it was necessary to drill without casing through the caving ore.

Exclusion of Existing Seepage

Any mine which has, or anticipates, seepage problems will have pumping equipment for removing water from the mine. Such equipment represents a continuous operating cost, which increases with the volume of water handled. Generally, mines which have water problems find that the volume of water pumped increases with the length of new drifts and with stopping operations. Thus it may at some point become economical to shut off some of the existing leaks rather than expand the pumping set-up.

The technique for doing this type of work is relatively simple, but an accurate dependable metering system is required. This differs from drill hole work which can and has been successfully done with batch systems.

The first requirement is a drill hole which intersects the leak channel, ten or more feet away from the point at which leakage is occurring. Next comes a pumping test with dye to establish pumping pressure, rate, and induction period. This is followed by the treatment.

Grouting Prior to Excavation

Grouting an area prior to excavation is a very effective means of preventing water problems in a localized area such as a drift or shaft. The procedure here would be to drill one

or more holes in the direction of the drift. When a water bearing zone is intercepted, pump in enough AM-9 solution to cover completely the area to be excavated. This is much the same procedure that would be used with cement or any other grout. However, AM-9 can be expected to flow into the very small fissures that would not take cement. In addition, work can proceed as soon as gelation occurs. Shafts and tunnels which could not be treated with cement have been dried up with AM-9.

Grouting of large areas prior to drilling and stoping is generally done with cement. This type of application will normally take a long period of time and use large volumes of material. The results of limited experimental work indicate that AM-9 is effective for general grouting. Wasting of AM-9 grout, however, will seriously affect the economics of grouting. Since it is impossible to evaluate the effectiveness of general grouting without placing large quantities of grout, the grouting programme must be established much more precisely if AM-9 is to be used rather than cement. This inevitably requires a careful analysis of the problem which can be accomplished with suitable drilling and dye tests.

Grouting Costs

In many cases, it is believed that the saving in labour will offset the higher initial cost of AM-9. Other factors, too, should be considered. Due to its lower viscosity, AM-9 will get into fissures too fine to be treated by cement. With a metering system, AM-9 can be readily placed at very short gel times. Each of these factors can result in a more effective grouting job. Although it is difficult to assign them an exact value, they are obviously on the plus side of the picture for chemical grouting.

This discussion should not be taken to mean that AM-9 is intended or recommended as a general replacement for cement, or any other grout. It does mean, however, that AM-9 should be an effective supplement to them. There are often distinct clear-cut conditions for which cement is the obvious choice, and other instances in which AM-9 should just as logically be applied. In addition, there is a large area of work in which either material or combinations of both could be used satisfactorily. For this overlapping area, comparisons such as those discussed can be of use in determining which grout to apply.

Deep Seismic Soundings of the Earth's Crust

IT is claimed by Russian scientists that there is a chance of establishing for the first time a direct inter-connection between the structure of the earth's crust at a great depth and the geology of ore deposits.

As reported by *Soviet News*, this conclusion has been reached by Kazakh geophysicists on the basis of the results of seismic soundings of the earth's crust at depths of 60 to 80 kilometres (37 to 50 miles), using the method worked out by the Soviet geophysicist Academician Grigory Gamburtsev. This depth corresponds to the thickness of the granite and basalt strata of the earth's crust.

A geophysical expedition of the Kazakh Academy of Sciences has compiled a map of a cross-section of the earth's crust along a 600-mile line (Balkhash-Temirtau-Petrovavlovsk) in Central Kazakhstan.

Irina Kosminskaya, who is a leading Soviet specialist in this field and a member of the staff of the Institute of Geophysics, has told a *Tass* correspondent that Kazakhstan's geophysicists have successfully continued the job begun in

that area in 1949 by Academician Gamburtsev's expedition, following a route from Lake Issyk-Kul to Lake Balkhash.

Gamburtsev's method favours explosion produced, not on the ground, but under water as being more effective. Water amplifies the waves created by the explosion which are directed towards the depths of the earth. According to Irina Rosminskaya, charges of only 400 to 1,000 kilograms of conventional explosives are used for deep seismic soundings. The weakest earthquakes are hundreds of times more powerful than the seismic vibrations resulting from such explosions.

Similar research has been carried out, and is being carried out in various parts of the U.S.S.R., and in particular in the Caspian and Black Seas, in Turkmenia, off the shores of Kamchatka and the Kurile Islands. It was also stated that the American Professors Frank Press and Maurice Ewing, who visited the Soviet Union, have made a thorough study of Gamburtsev's method. This method is now being used on a wide scale by American scientists in deep seismic soundings in the Atlantic and the Pacific.

THE WORLD'S STRONTIUM RESOURCES

IN a recent report on "Strontium," (Information Circular 7933) the U.S. Bureau of Mines has given detailed information on Strontium and its uses, world resources, mining and milling, chemical processing and the preparation of strontium metal.

Celestite (strontium sulphate SrSO_4) and strontianite (strontium carbonate SrCO_3) are the principal strontium minerals, the former being the more important commercially because of its more widespread occurrences. The compounds of strontium were confused with those of barium until the mineral strontianite was discovered to be a compound of a new element in 1790. Strontium metal was isolated by the electrolysis of fused chlorides in 1808.

Fields of Application

Strontium minerals are chiefly used as the basic raw material for manufacturing strontium compounds — primarily the carbonate, chloride, hydroxide, nitrate, oxalate and peroxide which have important uses in defence programmes, including tracer bullets, distress signals and other types of signals and flares. They are also used in fireworks, railway and highway warning fusées, in welding-rod coatings, in zinc refining, in depilatories, paints, greases, ceramics, dielectrics and sugar processing.

In addition to being the basic raw materials for manufacturing strontium compounds, celestite and strontianite have other uses in mineral form. Celestite has been used for the manufacture of well-drilling muds and as a rubber filler. Both minerals can be used for removing impurities from caustic soda and strontianite has been used in the desulphurizing of open-hearth steel. Because of its inherent instability the strontium metal itself has few uses.

Occurrence of Strontium Minerals

Strontium in small quantities or traces is common in igneous rocks; according to Clarke, the content averages about 0.034 per cent. It is more abundant than copper, lead, zinc, fluorine, nickel, and lithium but less abundant than vanadium, carbon, zirconium, chromium, sulphur or barium. Strontium is less abundant in sedimentary rocks than in igneous rocks. However, most commercial or potentially commercial deposits of strontium minerals occur in or near sediments or sedimentary rocks.

According to Rankama and Sahama no strontium mineral is known that is formed during the main stage of crystallization of igneous rock; notwithstanding its relatively high abundance, strontium only occasionally forms independent minerals in igneous rocks. The strontium minerals belong to the pegmatitic-pneumatolytic and hydrothermal stages of crystallization, and even in rocks formed during these stages they are rare. The bulk of strontium is concealed in the principal minerals of igneous rocks, basic igneous rocks being the poorest in strontium and acidic rocks the highest.

In thermal waters strontium is enriched in relation to calcium, and its content is higher than that of barium because barium sulphate is less soluble than strontium sulphate. Most commercial deposits or potentially commercial deposits of strontium minerals occur in or near sedimentary rocks, chiefly as beds or lenses associated with gypsum, anhydrite, or rock salt; in cavities or veins and disseminated in limestone and dolomite; or disseminated in shales, marls and sandstones. It may also be found associated with metalliferous ores, such as galena and sphalerite.

When certain conditions prevail, masses of celestite may be deposited from sea water along with anhydrite. Since considerable celestite is present in some saline deposits and none in others, it is believed that its deposition may depend upon the sulphate and chloride ions in the sea water reaching a certain, but up to the present time, unknown concentration. Examples of large sedimentary celestite deposits are those in the Keuper formation (triassic) of England, the Zechstein (Permian) of Germany, and some of the Cretaceous deposits in Texas and Arkansas.

The celestite deposits of Sicily and some of the deposits in southeastern California and western Arizona are believed to be derived from solfataras.

Strontianite is usually regarded as a secondary mineral resulting from the weathering of celestite.

Production and Reserves

The chief producers of strontium metals are Great Britain, Mexico and Germany. The minerals occur in small and erratic quantities in many of the American states, principally Texas, Arizona, California and Washington. Elsewhere, they occur in varying, though usually small, quantities in the Argentine, Australia, Canada, France, India, Poland, Sicily, Spain, Tunisia and, possibly in adequate quantities, in the U.S.S.R.

In the United States, deposits are thought to exceed anticipated requirements for many years. The U.S. Federal Geological Survey has estimated the domestic resources at 3,500,000 tons of material containing at least 85 per cent SrSO_4 . Some celestites and strontianites, however, have calcium and/or barium locked so intimately in the crystal that these elements cannot be removed except by chemical processes.

A vast untapped resource of strontium lies in the earth's hydrosphere. This element is one of the more abundant in sea water, having a concentration of about 13 grams per ton. Only eight other elements (Cl, Na, Mg, S, Ca, K, Br, and inorganic C) are present in higher concentrations. Some of these are at present recovered from this source; and, if demand warranted, strontium could probably be recovered.

Little is known of reserves outside the United States. However, there are indications that overall resources are large and that reserves of several individual deposits are substantial in terms of current and anticipated requirements.

Both celestite and strontianite are found at numerous places in England and Scotland, Britain being the world's principal supplier of celestite. Strontium derived its name from the small village of Strontian, Argyllshire, Scotland, where strontianite was first found occurring in veins with galena and baryte. The most important deposits at present and probably in the future, are those in Gloucestershire and Somerset. Celestite in this area occurs as irregular masses, lenticular bodies and fracture fillings in the Keuper marl and the Keuper dolomitic conglomerates, both Triassic in age. In recent years, the most prolific deposits have been those in a narrow belt running south several miles from Cromhall through Yate to Standhawe's Court. Although little information is available on reserves, during the past 80 years over one-half million tons of celestite have been taken from these deposits and remaining reserves appear to be substantial.

English celestite is relatively pure. Of 29 samples analyzed, the average strontium sulphate content was 91.1 per cent. The following table shows typical analyses of commercial celestite from three different producing mines in Gloucestershire.

	Yate Lawns	The Moors	Cowship
SrSO ₄ ..	98.60	92.10	97.40
BaSO ₄ ..	.25	.35	.95
CaSO ₄ ..	.11	nil	.10
CaCO ₃ ..	.06	4.91	.08
Fe ₂ O ₃ Al ₂ O ₃ ..	.26	.82	.34
SiO ₂ ..	.68	1.30	.04
Undetermined	.04	.52	.09

Though formerly small tonnages were recovered by many small operators, the work is now carried out by a few large producers, one of the largest celestite operations being about 20 miles from Bristol where some 6,000 tons are taken annually from an open pit. Production could be more than doubled if the market were available and new operations are believed to be possible in this area.

By 1943, the Mexican output of strontium minerals had reached 6,000 short tons annually, mostly from San Luis Potosi. The extensive workings of the 70-year-old Providencia gold-silver mine have facilitated exploration of the celestite veins and output here ranges from 400 to 700 tons per month. All the veins in this mine run east-west and are of the fissure type. There are two main celestite veins into which many stringers run. Most of the country rock is limestone though at Providencia it is mainly brecciated shale.

In the Sierra Mojada mine in Coaguila the minerals strontianite and celestite occur as vein fillings or gangue in lead veins, and the 5 to 10 per cent strontium sulphate in the ore was not initially recovered but sent to the smelter as part of the lead ore gangue. Some of the higher grade strontianite and lower grade lead pockets were left on the walls of the stopes. This, along with strontianite sorted out of the lead and left in the fill constitutes the reserve here. It is difficult to estimate what remains but it could be several thousand tons. Exploration, now in progress, to find strontium-bearing pockets or veins is encouraging and could lead to additional mines being developed.

One of the principal suppliers of celestite in Mexico is the San Augustin mine in Sierra de La Paila which is operated only for near 95 per cent SrSO₄ celestite, of which more than 200 tons is won annually. Reserves are believed to be adequate for several years.

Celestite also occurs in limestone deposits being mined near Mexico City.

Methods of Mining

The method of mining strontium minerals depends on the nature of the individual deposit, and the rate and scale of extraction. Because of the small tonnage requirements, strontium minerals have been produced only by simple methods and on a small scale.

In the United States, strontium ore is selectively mined either from surface outcropping beds by simple open pit methods or from veins by short adits and drifts. Mining is followed by hand picking, rough sorting and loading. One of the most serious deterrents to the development of American deposits is the difficulty in concentrating the strontium minerals to an acceptable grade. During World War II several methods were used in an attempt to produce a chemical grade celestite from low-grade Texas ores.

In England, the celestite masses, located by probing the soil with long rods, are mined by open pit methods. The pits rarely go deeper than 20 or 30 ft. The celestite lumps formerly were hand cobbled and trimmed, carted to Yate or other stations, taken to Bristol and loaded on ships for export. During the past few years, however, gravity concentration equipment has been installed at the English deposits. The celestite is now reduced in a jaw crusher to about 2.5 in. and heated in a rotary, oil-fired drier with a forced-hot-air draught, that both dries the mineral and blows away some of the adhering clay and dirt. It is then further crushed, ground, air-floated and finally bagged for shipment.

At the San Luis Potosi mine in Mexico the celestite on the hanging walls of the gold-silver-lead veins with concomitant stringers has been mined by hand. Special care is exercised in blasting to prevent the mineral from becoming contaminated with the wall material.

To this end small charges of dynamite are placed in large drill holes, so that the ore stays in place after blasting, thus avoiding contamination with waste material. The ore is sacked at the face and carried to the surface by men. When the ore is not broken in mining, the cleaning is accomplished by hand sorting, as it is comparatively easy to remove large chunks of calcite or other pieces of waste. However, at times the ore is badly shattered, and it is then necessary to screen all the material as it comes from the mine. The minus one-half inch material is hand-cleaned and again sized on a one-eighth screen. The plus product is hand-jigged to remove the waste and is then mixed with high-grade ore.

The celestite being mined in Coaguila is produced by similar methods.

Production of Compounds and Metal

As the bulk of the strontium consumed is in the chemical rather than the mineral form, it is necessary to convert the raw material to one of several strontium compounds. Many methods have been patented and used for the conversion of strontium minerals to strontium chemicals. The two most commonly used in recent years are: 1. The soda ash process, in which finely powdered celestite is digested in a hot soda ash solution, yielding the less soluble strontium carbonate, which is in turn treated with the appropriate acid to make the desired salt; and 2. the calcining process, in which finely powdered coal is burned with celestite, producing a soluble strontium sulphide, which is leached from the clinker with water, and the carbonate may be formed by treating the solution with carbon dioxide.

Strontium metal is prepared by thermal reduction of strontium oxide and aluminium metal, subsequent distillation under high vacuum, and condensation of the metallic strontium on a cooled electrode. This method yields a product containing over 99 per cent strontium. The metal can also be produced by electrolysis of a fused bath of strontium chloride and ammonium or potassium chloride.

Strontium amalgam can be made from aqueous solution, but it has not yet been found feasible to recover the pure metal. Strontium has, however, been prepared by electrolysis of a fused mixture containing 84 per cent strontium chloride and 16 per cent potassium chloride in a graphite crucible with cooling of the upper cathodic space.

Strontium metal is rather difficult to prepare and is relatively expensive. Molten strontium readily forms oxides, hydrides, nitrides, and carbides, and this makes melting and pouring difficult. The metal reacts with virtually all of the common gases, such as oxygen, hydrogen, nitrogen, and carbon dioxide, and it is impractical to carry on melting and pouring operations, except in inert atmospheres of argon or helium.

Machinery and Equipment

Stable Hole Conveyor Speeds Longwall Extraction

The new Joy-Sullivan stable hole conveyor or Miniveyor, illustrated on this page, has been designed to save manpower in making stable holes at the ends and in advance of mechanized longwall faces. Existing methods, often calling for hand-casting of coal are particularly inefficient on rapidly advancing faces, where delay in stable hole preparations can affect the turnaround and reversal of loading machines and advance of conveyor gearheads and tail-ends.

Other applications of the conveyor include use on initial drivage of breakthroughs in bord and pillar operations, and on single unit faces for conveying rib-side coal adjacent to maingates where rib-side packs are required. In fact there are many underground applications for a conveyor of this nature embodying features of portability and compactness.

Essentially, the new conveyor comprises a lightweight, all steel belt-carrying frame of welded construction, with electric motor/drive pulley assembly at one end and an adjustable return pulley (for tensioning purposes) at the other. The entire unit can be mounted on .8 in. castor wheels or skids allowing movement and positioning. A 2 h.p. motorized driving drum powers the conveyor, and is operated from a standard drill panel. Embodying its own electric motor and reduction gearing, the drum drives the belt at 175 f.p.m., conveying coal at the rate of up to 50 tons per hour. A removable hopper is situated above the driving drum to facilitate coal filling.

Although the unit employs an 18 in. wide belt, carried on full length stainless steel strips positioned to give suitable troughing characteristics, the maximum overall width of the driving unit is only 2 ft. 8½ in. This is made possible by the arrangement of motor leads, which are led to a junction box mounted on the side of the conveyor. Overall standard length of the unit is 11 ft. 4 in., with drum centres at 10 ft., although various lengths may be specified between 8 ft. and 20 ft. 4 in.

WIDE RANGE OF EQUIPMENT

Recent literature from Crofts (Engineers) Ltd. gives details of the manufacturers' range of equipment, much of which is of application in the mining industry. Powergrip timing belt drives at powers up to 64 h.p. at 6,000 r.p.m., free space hydraulic couplings and emergency slipping devices are all described fully in attractive pamphlets. The conveyor pulleys are for belt speeds ranging from 70 to 500 f.p.m.

In the field of motors, Crofts manufacture the Ritespeed series from 1 h.p. to 20 h.p. and these equipments incorporate the Brush industrial type electric unit. Multispeed motors range from fractional to 1 h.p., the worm geared types rising to 5 h.p., whilst the Radiation machines range up to 20 h.p.

Other equipments produced by Crofts (Engineers) Ltd. include the Croft-Ring

flexible and resilient couplings for which patents are pending, the small power worm reduction gears of standard, inverted and vertical type which can be supplied also as geared motors, inverted and vertical only.

These manufacturers also produce patent magnetic clutches and brakes in thirteen sizes at powers up to 50 h.p. at 100 r.p.m. Stock clutches are wound for 24 volts d.c.

AUTOMATIC WEIGHING

To meet growing demand, Elcontrol Ltd. have recently developed an automatic weighing control equipment. It is intended for heavy industrial use. Typical applications which have been dealt with include maximum weight control on

Buxton certified and intrinsically safe.

The equipment is stated as suitable for the range of weights normally covered by standard load cells, from 50 lb. up to 1,000 tons or more, and is provided with operating adjustment over any desired range of weights. It gives repetitive accuracy of better than 1 per cent.

ERECTION OF A TOWER-MOUNTED FRICTION WINDER

An excellent example of a tower winding structure is that erected in the N.C.B. West Midlands Division No. 1 Area at Wolstanton. This winder tower, which is of reinforced concrete (about 8,000 tons) is 159 ft. high and has an overall plan area of 57 ft. × 92 ft. It was de-



mineral hoists, where the loaded skip weight is checked; control of sand in batching hoppers in foundry work; and control of load on lengths of conveyor.

This equipment involves the use of one, two or three load cells on which the load, e.g., hopper, conveyor section, truck or loading platform—is supported. The load may alternatively be suspended from up to three suspension type load cells. The load cells are connected to a remote relay unit which integrates the output from the cells. The integrated output current is monitored and when it reaches a value corresponding to the selected operating weight, the relay in the control unit is operated and actuates the control mechanism, e.g., conveyor motor, chute gate, automatic valve, diversion plough, etc.

The load cells are of standard construction. The relay unit, in accordance with normal Elcontrol practice, consists of a withdrawable chassis housed in a cast weatherproof case suitable for outdoor mounting, or in a sheet steel case with hinged lid for indoor use. It can also be supplied in a flameproof version,

signed to accommodate two 3,300 h.p. direct-coupled overhung Ward-Leonard winders together with their M.G. sets and auxiliary equipment. Its erection is described by G. E. Woodliffe, in *B.T.H. Activities*, Vol. 30, No. 6.

The largest item of plant to be installed in this tower was the winder motor, the armature of which was the largest individual item to be handled, having an overall dia. of 12 ft. and weighing 32 tons. The method of erection differed somewhat from that usually employed with a D.C. machine, the bottom half of the frame being placed in position after the armature. The armature is provided with a coupling which takes the form of an annulus located on the centre of gravity of the machine. This coupling is suitable for a number of semi-fitted bolts and has a small spigot mainly for location purposes. In this design, the armature is opened up and the bolts accurately tensioned by hydraulic means, the motor torque being transferred to the drum shaft by surface friction between the two halves of the coupling.

A screening and storage plant used in mining aggregates from the sea bed and made by Frederick Parker Ltd., was erected in Southampton Docks in 1947 to be followed by a second at Leamouth Wharf, Southampton. There are similar Parker plants at Twyford Wharf, Portsmouth and Pottery Quay, Plymouth, and a further plant for Southampton has just been purchased. At the South Coast Sand and Ballast Co. Ltd. screening plant at Portsmouth, the material is unloaded from the ships and fed to an Oscillex horizontal, vibrating screen set above the storage bins for $1\frac{1}{2}$ in., $\frac{3}{4}$ in., $\frac{1}{2}$ in. and $\frac{1}{8}$ in. materials. The plant grades about 40 to 50 cu. yd. an hour, and this material is used in local building operations and in the company's own ready mixed concrete plants. The Oscillex, made by Parkers, is a two-tray counter balanced horizontal screen designed to handle large capacities and gives accurate screening at low operating costs. The two trays are independently mounted and the movement of each is opposed to the other to cancel out the forces set-up by each tray.



Equipment Digest

A new electronic measuring device accurate within $\frac{1}{2}$ in. over 5 mi. of unobstructed terrain has been introduced by Sweden's Svenska AB through its distributor, Surveyors Service Co., Los Angeles. Called the Geodimeter, it projects a highly collimated light beam to a distant reflector. The light is reflected back to the Geodimeter by multi-prism reflectors to thus determine the distance the light waves have travelled.

Designed for surveyors, engineers and mapping parties, the Model 4 is only 12 in. sq. and weighs just 35 lb. It has been calibrated for measuring distances up to 3 mi.

★

Pipes carrying hot or cold fluids are normally carried above the ground on suitable supports. An underground installation would often be far more convenient, but is avoided because of the large capital cost of well constructed culverts or ducts adequate to protect the lagging from ingress of water. A new and greatly simplified system provides a simple insulation system which can be

installed in an excavation of small dimensions. It is claimed to be fully effective even in waterlogged ground.

The pipe is surrounded by a mechanically strong and thermally effective insulating jacket. A U-shaped trough of sheet metal is then suspended from the pipe by a series of non-corroding hanger rods, and melted bitumen is poured to fill between trough and insulation.

This type of installation by Stillite Products Ltd., has obvious applications in the mining industry.

★

The aluminized asbestos manufactured by Turner Brothers Asbestos Co. Ltd., conforms with the Colour Code of B.S. 1710/51. Asbestos cloth is now transformed in appearance by the aluminium metallic layer machine-bonded to it with a special thermosetting resin of exceptionally high tenacity and high temperature resistance. Modern adhesives can now be used to apply the fabric swiftly and economically over the pipe lagging, to produce a tight and smooth vapour-proof finish.

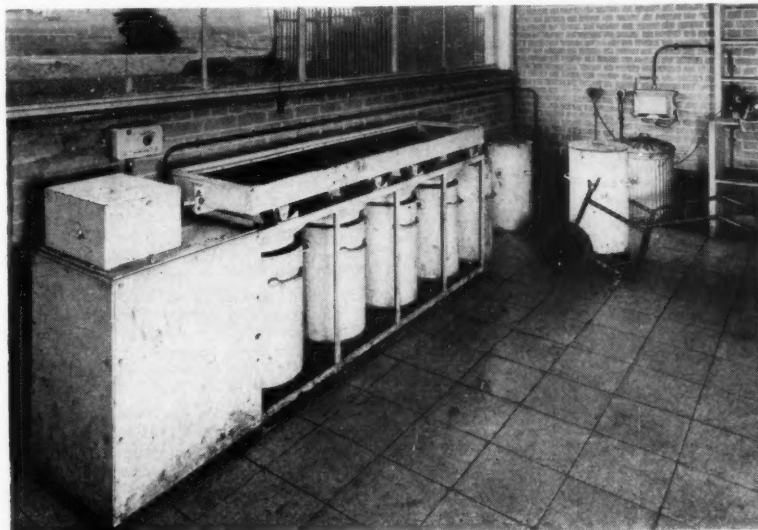
In the actual method of tightening the coupling bolts, the bolts are placed in position and the nuts hand-tightened, the jack is attached to the coupling bolt and pressure applied to the jack by means of a small hand pump. The pressure is built up to a value predetermined in the factory by means of electrical strain gauges, and the coupling nuts tightened by means of a tommy bar inserted through a slot in the wall of the jack.

The reason for assembling the armature prior to placing the bottom half of the frame in position, is that usually an armature is lifted by its shaft. Since this armature is without a shaft it was necessary to support the armature in slings around the periphery and these slings would have fouled the bottom half of the frame if left in position. The motor bedplate is extended in an axial direction, so that it was possible to place the bottom half of the frame on the bedplate and then jack it sideways under the armature. The top half of the frame was then dropped into position to complete the erection of the machine.

The extended pit for the winder motor not only provides for easy erection of the machine but allows the whole frame to be moved sideways for inspection of windings, etc., in service.

The major problem associated with the installation of friction winders is that of handling the large items of plant. In comparison with a geared winder, the direct-coupled winder reduces the amount of installation work and gives a more compact layout, the reduced building cost off-setting the higher initial cost of such a machine.

A new type of sample screening machine is now being marketed by Birtley Engineering Ltd. The design has been introduced to meet the need for a compact, high capacity unit for the grading of bulk samples in preparation rooms and laboratories. A single screening surface is employed, incorporating four screen plates of the sizing required, through which the graded product passes to detachable and transportable containers positioned under the machine.



Metals and Minerals

— And Now Kaiser

Four North American companies—Alcoa, Reynolds Metals and Kaiser, together with Alcan, a subsidiary of Aluminium Ltd. — between them produce some two-thirds of the total Free World output of aluminium.

Alcan has long had an important outlet in the U.K. through Northern Aluminium, which accounts for about one-third of the U.K. fabricating output. Until little more than two years ago, however, none of the three major U.S. producers had a direct stake in the British market. Now, with the acquisition by Kaiser of a 50 per cent interest in James Booth, they have all gained a foothold in the U.K., whether through subsidiary or part-owned companies.

Britain's attractions as a market with great potentialities for further expansion were, of course, greatly enhanced by the appearance of a world surplus of metal, which led U.S. producers, hitherto pre-occupied with developing their own domestic market, to cast their eyes further afield in an intensive search for new sales outlets.

In September, 1957, Reynolds Metals acquired a half interest in the aluminium division of Tube Investments, which at that time accounted for about 10 per cent of U.K. fabricated products. Early last year came the battle between Reynolds and Tube Investments on the one hand and Alcoa on the other for the control of British Aluminium, which, besides producing a third of all aluminium products made in the U.K., is the only company in the U.K. producing virgin aluminium and also has important overseas interests, notably a 60 per cent share in the Canadian British Aluminium Co. and a half share in its Norwegian associate, D.N.N. The contest ended with the acquisition of British Aluminium by the Reynolds-T.I. combination.

Alcoa's entry into the British aluminium industry, was not long postponed, however, for in June last year came the announcement that agreement had been reached with Imperial Chemical Industries for the formation of a new holding company called Imperial Aluminium, owned as to 49 per cent by Alcoa and 51 per cent by I.C.I., to take over I.C.I.'s aluminium plant in South Wales.

It was scarcely to be expected that Kaiser would be content to remain "odd man out" in what is regarded as one of aluminium's most promising markets. Little surprise will have been occasioned, therefore, by the news that it has linked up with the Delta Metal Co. Ltd. for the formation of a new aluminium fabricating company. The new company, which is to be known as James Booth Aluminium Ltd. will succeed Delta's subsidiary, James Booth and Co. Ltd. In announcing this move, Mr. D. A. Rhoades, president of Kaiser, said that the American company would invest \$14,000,000, being half the initial capitalization of the new company. All these funds would be used to expand Booth's Kitt Green works at Birmingham, extending the range of its wrought aluminium products and bringing the plant into line

with all modern techniques. Delta will continue to manage James Booth and control of the new company will not pass out of British hands. Kaiser's function will be to assist management in all production and marketing activities.

Mr. Rhoades expressed the view that the aluminium market in the U.K., which he described as being second only to the U.S. in aluminium consumption, would expand rapidly during the next decade.

Consumption of aluminium in the U.K. last year is estimated to have risen by at least 15 per cent above the level ruling in 1958 and indications point to a continuation of the upswing during the current year. In view of the fact that the four major North American producers all have direct access to the British market, and having regard to the ample reserve capacity currently available to take care of any upsurge in demand, it is evident that in the foreseeable future the expansion of the British aluminium industry is unlikely to be held up by shortages of primary metal. Completion between the various companies with the immense resources behind them will obviously be reflected in vigorous campaigns of sale promotion.

The plans of U.S. aluminium producers for territorial expansion are not, of course, by any means confined to the United Kingdom. It was also announced last week that Reynolds International Inc., subsidiary of Reynolds Metals, was negotiating with the Venezuelan Government for the construction of a multi-million reduction plant on the Caroni River in Venezuelan Guayana. No investment figure has so far been mentioned, but the programme calls for a plant that will produce 25,000 s.tons of aluminium per year initially from imported bauxite. Venezuela's present annual requirements are 20,000 s.tons, leaving a balance of 5,000 s.tons for export. Power would be obtained from the hydro-electric plant which the Venezuelan Government is constructing on the Caroni River. No date has been set for signing the final agreement with the government, which, however, is unlikely to be long delayed.

Kaiser hopes to gain a foothold in the growing Indian market through the newly formed Hindustan Aluminium Ltd., in which it has a 27 per cent interest. Now that the Export-Import Bank has agreed to provide \$13,600,000 of a required total of \$35,000,000 financing, actual construction of the reduction plant and other facilities is expected to start early in February. The plant is to be erected near New Delhi, close to the new Rihand Dam from which the energy required will be derived. It will comprise two units—an aluminium installation and a 20,000 tonnes reduction unit.

*

Growing concern is being felt in the Greek mining industry as to the eventual effect on the country's exports of mineral ores, notably bauxite, of the impressive development drive in overseas territories controlled by the European Common market countries. The fact that bauxite

production is being stepped up in French and Belgian territories in Africa is being viewed with considerable uneasiness, having regard to the preferential treatment which these territories would enjoy following the progressive tariff reductions by member countries of the European Economic Community.

For several years Greece's bauxite exports have been consistently directed to Western Germany and the Soviet Union. Exports to Western Germany are seen as being directly threatened by the stepping up of bauxite production in colonial territories of European Common market countries. It is also feared that the extraction of alumina from nepheline strata, now being undertaken in the U.S.S.R. will lead in a few years to a substantial reduction, and perhaps even the elimination, of Soviet bauxite exports.

These facts have led certain influential Greek experts to urge the need for speeding up the establishment of an alumina industry in Greece. Emphasis is also being placed on the desirability of taking steps, during negotiations with the Committee of the European Economic Community, to secure for Greece's mineral ores equal treatment with those produced in territories controlled by Common Market countries.

BAKER PLATINUM RAISES PRICE

As was generally expected, Baker Platinum, has raised its price for platinum from £28 10s. to £30 5s. per troy oz. as from January 25. The company's U.S. price was raised on the same day by \$5 per troy oz. This follows similar increases by Johnson Matthey, announced in our last week's issue, which took effect from January 21. Platinum's present strength is attributed to the renewal of a strong, genuine demand. Although some speculative buying has been noted during the past few weeks, the main demand has been from the glass, glass fibre, oil and gas industries.

Now that a uniform price of £30½ per troy oz. has been established for platinum by the two leading refiners of precious metals in the U.K., the uncertainty prevailing earlier in the free market has been removed to some extent, and it is understood that a small amount of business has been transacted at around £28½-£29½ per troy oz., but both buyers and sellers are acting cautiously at the higher levels. It is understood Russian platinum is available at around £29 per oz.T.

STRONG CADMIUM MARKETS

On both sides of the Atlantic demand for cadmium remains strong and the market undertone is very firm. In the U.S.A. the price of cadmium was increased by 10 c. per lb. by American Smelting and Refining Co. to a basis of \$1.50, effective January 7. The advance, which has been followed by some other U.S. producers, was attributed to very active demands from the electroplating and chemical industries, together with rising demands in Europe. The last pre-

vicious rise in the U.S., also of 10 c., was on October 1 last.

In the U.K. American metal is still available at 10s. per lb. On the other hand, Belgian prices to all markets have been advanced, with the probability that, after paying duty, Belgian cadmium is unlikely to be available to U.K. consumers at much less than 10s. 2d. per lb. delivered.

The latest figures issued by the British Bureau of Non-Ferrous Metal Statistics indicate that during the first eleven months of last year total U.K. consumption rose to 1,149,700 lb., as compared with 931,850 lb. in the corresponding period of last year. A similar improvement has in all probability been recorded in Western Europe. Conversely, the voluntary restriction of zinc supplies had adversely affected the production of cadmium in certain countries, notably Belgium, so that in all probability there has been some diminution in the total cadmium supply. All this adds up to a very firm cadmium market in the months ahead.

NICKEL CONSUMPTION RISES

Free World consumption of nickel in 1959 exceeded 200,000 s.tons, being about 25 per cent over the 160,000 s.tons consumed in the previous year, states Dr. John F. Thompson, chairman of the board of directors of International Nickel, in his review of the nickel industry. A further substantial increase is expected this year. Despite the considerable rise in 1959 consumption and the uncertainties in Cuba, Free World supplies of nickel continue ample.

The past year was marked by improved business conditions, which were reflected in increased nickel demand and a renewed interest in the applications of nickel by industry. Despite the prolonged steel strike in the U.S., nickel consumption in that country increased by about 35 per cent over 1958. Marked gains in nickel consumption were also recorded in the U.K. and other European markets. A break-down of consumption by uses will be given in our next issue.

Free World capacity for nickel production in 1959 from all sources was at an annual rate of about 275,000 s.tons. This capacity is expected to increase by 50,000 s.tons, or 18 per cent, in the next two years. During the latter part of 1959 the changed political situation in Cuba introduced an element of confusion in that country's nickel industry which has not been entirely resolved and the forecast of increased capacity was made with this fact in mind. The Thompson project in Manitoba, it was stated, took on added significance in light of the current situation in Cuba.

GALLIUM AS A SPACE METAL

A new material with unique properties has been developed by the U.S. Army Signal Corps for space-age projects. It is gallium phosphide, a highly heat-resistant compound formed from two low-melting point elements—gallium and phosphorus. The material also has semi-conductor and photoelectric properties. Since it can withstand about 1,500 deg. F., it might be used for missile nose cones. The gallium is a by-product of the aluminium industry and costs about \$1,500 per lb., but the cost

of the phosphorus is very low. Since the compound contains only a small amount of gallium, economic application may be feasible.

TURKISH CHROMITE PROPOSALS

The Turkish Chrome Committee, representing private mine owners, have made a number of proposals to the Turkish Government which, if adopted, would enable prices to be reduced and sales to be increased. As a result of high prices, Turkish chrome ore producers have lost a number of markets.

The Committee ask for reduced railway, port and insurance charges for chrome ore, as well as specially reduced prices for fuel and motor vehicle tyres used in the transport of ore. In addition, they want permission to export chrome ore on credit terms and long-term credit facilities to enable Turkish mine-owners and exporters to accumulate stocks. Finally, the Committee ask for the right for exporters to retain part of their earnings in foreign currency to purchase foreign equipment for the modernization of their mines.

The U.S. Agriculture Department

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

Apart from the continued upward movement in copper, the overall picture as far as prices are concerned has undergone no material change during the week. Trading has been active and such factors as the increase in the Bank Rate, lower Wall Street advices and temporary unsettlement on the London Stock Market, have failed to disturb the general trend.

COPPER RISES SHARPLY

The sharp advance in London copper values has been the main feature of the market, with particular emphasis on the near-by position which has resulted in a substantial widening in the backwardation to some £18 per ton. At present levels the market has topped the previous high established during the recent upward movement early in November last year. This can be attributed in part to the local technical considerations supported by well-maintained consumer demand, mainly from the Continent. Against these enquiries there is little free metal available and L.M.E. stocks at 4,997 tons, which only show a decline of 50 tons over the previous week, are at an extremely low level.

Whilst an increase in the Bank Rate had become increasingly likely during recent weeks, any effects, such as the higher financing costs consequent on the 1 per cent rise, were completely outweighed by the technical position on the market. The position, as far as the strikes

seeks to barter 80,000 tonnes of U.S. surplus wheat for Turkish chromite. It has been announced that offers will be received up to 17.00 hours Eastern Standard Time on February 1 for metallurgical grade chromite's produced in Turkey in exchange for Commodity Credit Corporation-owned wheat. It was expected that the wheat would be delivered to Turkey up to June 1. Chromite received in exchange must be delivered to the CCC within one year from the dates of individual barter commitments. The chromite is to be added to the supplemental stockpile of strategic materials.

Under a trade pact covering the years 1960 to 1962, China will supply the East German Republic with quantities of tungsten, antimony, borax, quicksilver and molybdenum ore in exchange for plant and machinery.

Mr. G. J. MacMahon of Britain was elected chairman of the International Study Group on Lead and Zinc when the Group opened its first meeting at Geneva on January 27. Mr. Clarence Nichols of the U.S. was elected vice-chairman.

in the U.S. are concerned, is no nearer solution. Various meetings have been taking place between the companies and the unions but neither side can report any progress. In the case of Phelps Dodge and Kennecott, a stalemate has been reached over the inclusion of the normal "no strike" clause in the contract, whilst Anaconda's talks have been recessed indefinitely. Consequently, consumer buying has been on a much improved scale and in active trading, mainly for February delivery, the dealer asking price has been advanced to 39 c. The producer and customs smelter prices, at 33 c. and 35 c. respectively, remain unchanged, whilst scrap copper is $\frac{1}{2}$ c. higher at 26 $\frac{1}{2}$ c. The Belgian price has been advanced during the week from B.frs. 35.50 to B.frs. 36.00 per kilo.

U.S. imports of refined copper for November amounted to 44,000 s.tons against a monthly average for the first ten months of 1959 of 13,000 tons. This substantial increase, together with a reduced export rate, alleviated what would otherwise, as a result of the strike, have been a very tight supply position. Figures issued during the week show that U.S. domestic consumption of copper by brass and wire mills and foundries in December totalled 88,706 s.tons compared with 102,837 s.tons in November, whilst the new business booked by fabricators also showed a decline at 67,039 s.tons compared to 115,920 s.tons. Stocks of refined copper in fabricators' hands at the end of December amounted to 414,757 s.tons as against 412,401 s.tons.

TIN IN BRISK DEMAND

Consumer interest in tin, particularly from U.S. tinplate sources, continued at a satisfactory level and the scarcity of offerings of nearby metal in London has resulted in higher backwardation. It was announced during the week that at the end of September last year the buffer stock held 11,150 tons compared to 13,990 tons at the end of June. This is approximately in line with market estimates and it is unlikely that the figure for the end of December, when it is announced, will show any great change.

The recent upward trend in the Eastern price was reversed over the weekend but since then values have staged a partial recovery. Stocks of tin in official warehouses increased 110 tons at the end of last week to 8,718 tons.

LEAD-ZINC MARKING TIME

The lead and zinc markets have been quiet and would appear to be adopting a cautious attitude whilst the International Study Group meetings on these two metals are taking place in Geneva. Basically, however, both markets keep up a satisfactory undertone, attributable in the main in the case of lead to the better tone in the U.S., whilst in the case of zinc in consideration of the generally sound statistical position of the metal. In both cases there have been increased offerings of nearby metal which have resulted in the maintenance of a small contango in lead and a sharp reduction in the backwardation on zinc to barely £1 per ton compared to some £5 per ton earlier in the month.

The American Smelting and Refining Co. have recently increased their premiums on electrolytic zinc by $\frac{1}{4}$ c. to bring their price in line with that generally quoted, namely a premium of $1\frac{1}{2}$ c. and $1\frac{3}{4}$ c. on special and special high grade. The American Zinc Institute have stated that zinc consumption during 1959 in the U.S. will show an increase of 75,000 tons over the 1958 figure in spite of the prolonged steel strike which is estimated to have cost the industry some 80,000 tons of consumption. This authority estimates that total consumption for the year will be in the region of 944,000 tons compared to 868,327 tons.

Closing prices are as follows:

	Jan. 21		Jan. 28	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£260½	£261	£272	£273
Three months ..	£246½	£247	£254½	£255
Settlement ..	£261		£273	
Week's turnover	13,225 tons		13,800 tons	
LEAD				
Current ¼ month	£74½	£74½	£75	£75½
Three months ..	£74½	£74½	£75½	£75½
Week's turnover	10,650 tons		9,150 tons	
TIN				
Cash	£792½	£793	£794	£794½
Three months ..	£790	£790½	£788	£788½
Settlement ..	£793		£794½	
Week's turnover	705 tons		660 tons	
ZINC				
Current ¼ month	£93½	£94	£93½	£94
Three months ..	£92	£92½	£92½	£92½
Week's turnover	6,500 tons		5,900 tons	

London Metal and Ore Prices appear on inside back cover.

Mining Finance

"Tanks" Goes into Timber

Tanganyika Concessions is extending the timber part of its business, hitherto based on conifer forests owned on the eastern boundary of Southern Rhodesia. The extension comes through the acquisition of a controlling interest in Boxes and Shooks, a South African firm operating as saw millers, box manufacturers and timber merchants and who have a subsidiary, Novobord, which makes particle board. A new company, Commonwealth Timber Industries, is being registered in Salisbury with an authorized capital of £2,250,000 which will be held as to 60 per cent by "Tanks" and 40 per cent by the vendors of Boxes and Shooks. The new concern will acquire the Boxes and Shooks capital and will finance and organize the manufacture of the Novopan type of particle board and a new type of box wood in the British Commonwealth.

An important part of the agreement is that the Boxes and Shooks management will not only retain a substantial interest in the venture, but will also continue to provide the necessary technical knowledge. The whole new venture will, of course, tie in with the Rhodesian timber business. The "Tanks" management are optimistic about this new branch of the company's activities and it is encouraging that the Board headed by Captain Charles Waterhouse are not content merely to sit back and enjoy the fruits of the company's holding in the big Belgian Congo copper producer, Union Minière.

UNION MINIERE DOING WELL

At the recent "Tanks" annual meeting in Salisbury, Southern Rhodesia, the chairman was able to underline the fact that Union Minière is doing very well indeed and continues to live in peace despite the troubles in the rest of the Belgian Congo. Copper output last year was a record 280,000 tonnes and this, in conjunction with a higher metal price, should enable Union Minière to increase its dividend for that year. This will in turn enhance "Tanks" revenue for its financial year ending on July 31 next. And subject to the market's capacity to absorb it Union Minière hopes to further expand production in 1960. At the moment there is certainly no doubt whatsoever that the company could sell every ton that could be produced because with the strikes in the U.S., producing industry still dragging on a marked shortage of metal has developed.

Unfortunately the Congo political unrest has made its mark on the price of Union Minière shares in Brussels. When "Tanks" last balance sheet was made up on July 31, 1959, Union Minière stood at 4,000 francs. They are now only 2,590 francs. But providing that the business is able to carry on in peace, as it seems likely to do at the moment, this decline should be only a temporary one. Once the Kariba dam comes into operation Union Minière will have spare power resources and it is quite possible that a further major expansion of output might be undertaken.

"Tanks" paid 3s. 9d. per 10s. stock unit for 1958-59. On this basis the yield at 47s. 3d. (compared with a 1959 peak of 57s. 6d.) is 7.9 per cent which is quite good, especially with the possibility of a higher payment for the current period.

JANTAR'S COLUMBITE SALES

Last week the preliminary results for Jantar Nigeria, the tin and columbite producer, were commented on here. Now the annual report for the year to last September has appeared. In it the chairman, Mr. C. A. P. Tarbutt, confirms that the demand for columbite, "particularly for the grade of ore that your company produces" has increased during the past year. At the same time "slowly rising" prices have been obtained. The whole of the 1959-60 output of this metal has been sold forward at prices to be negotiated quarterly. Moreover, on the assumption that the future demand for columbite will at least be maintained and may increase, it has been decided to start working the company's primary deposits of columbite on an experimental basis.

Mr. Tarbutt points out the need to conserve cash resources. Some capital expenditure will be involved in opening up the primary columbite. More will be needed when a decision is possible to re-open the Basalt Lead tin resources. It is stated that another attempt must be made to work this deposit economically at a high production rate. But this must await the ending of tin restriction. Jantar has a good ore reserve position already established. It consists of 1,404 tons of tin and 1,796 tons of columbite compared with the 1958-59 production of 147 tons of tin and 232 tons of columbite. Jantar 2s. 6d. units firmed up to 4s. 9d. ex dividend on the chairman's statement. The yield on the 4½d. paid for last year is 7.9 per cent.

HIGHER TIN INTERIMS

In view of the way in which the tin price keeps up in the face of the rising production quotas allowed under the International Tin Agreement, 1960 is bound to be a year of increasing dividends from the producing companies. This week has certainly underlined this. Amalgamated Tin of Nigeria, which also produces columbite, has stepped up its interim for the year to March 31 from 6 per cent to 8 per cent on the 5s. shares. The 1958-59 final was 8 per cent. Some increase in this will now be expected. The shares stand at 10s. 10½d. Southern Kinta, the multi-dredge Malayan producer, is raising its second interim for the year to March 31 from 20 per cent to 25 per cent on the 4s. shares. This makes 37½ per cent to date against 32½ per cent a year ago when the final was 52½ per cent making a total of 85 per cent which is now almost certain to be exceeded this year. Present price is 30s. 6d. Kamunting, which has dredges in both Malaya and Siam, is putting up its interim for the year to March 31 by 2½ per cent to 10 per cent on the 5s. shares which stand at 15s. 6d. The 1958-59 final was 17½ per cent.

Petaling Tin, another multi-dredge Malayan concern, is paying a second interim of 10 per cent on the 2s. 4d. shares. This makes 20 per cent for the year to October 31 last against nothing for 1957-58 when the company was passing through a difficult period with heavy capital expenditure and severe restriction of output. The shares are 8s. 1½d. cum the interim of

2.8d. gross to yield 5.8 per cent. There will presumably be a larger distribution for the current year. Geevor, the Cornish producer, is not raising its interim which remains at 6d. per 5s. share for the year to March 31 next. Last year the final was 2s. plus a bonus of 6d. This mine is, of course, not in the restriction scheme so is not now recovering from the effects thereof as the Far Eastern companies are. Geevor are quoted at 21s. 6d. cum dividend to yield over 14 per cent on the 1958-59 total of 3s. It looks as though the market may be doubtful whether the bonus will be repeated for the current year.

S. AFRICAN PLATINUM SHARES

The improvement in South African platinum shares following the latest rise in the metal price is referred to under "London Market Highlights". It may be useful at this junction to recall once again the set-up in this market. The operating company in South Africa is Rustenburg Platinum Mines. There are no dealings in this concern's £1 shares. The issued capital of £868,600 is held by three companies, Potgietersrust Platinums, which has 43.3 per cent. Waterval (Rustenburg) Platinum with 39.2 per cent and Union Platinum with 17.5 per cent. Rustenburg fell out of the dividend list in the year to August 31, 1958, but returned to it in 1958-59 with a distribution of 26s. 3d. per share which enabled Potgietersrust to pay 9d. per 9d. share. Waterval 1s. 3d. per 2s. 6d. share and Union 1s. 1½d. per 5s. share. Yields on this basis are in the region of 7 per cent so buyers have been coming in for the shares on the theory that Rustenburg, and therefore the holding companies, will pay more for the current year to next August.

This is a reasonable theory, although Rustenburg will be facing a rising tax bill. It is hardly likely to be selling less platinum than a year ago. As to price, in the first four and a half months of 1959-60 it will have been getting £28 10s. per ounce and on January 20 the price was increased by Johnson Matthey, which handles Rustenburg's platinum, to £30 5s. In the financial year to August 31 last the average price was only £24 13s. So Rustenburg is obviously heading for a better year and industrial uses of the metal are broadening.

Financial News and Results

Latest from Can-Erin.—A new progress report from Can-Erin Mines states that development since the last report two months ago is beginning to indicate that the mining potential of the operation is larger than the most enthusiastic previous estimates had envisaged. The possibility is now presented that ore reserves down to the 2,500-foot level will total some 6-7,000,000 tons averaging 2 per cent copper. Previous estimates had been of the order of 4,000,000 tons.

Pronto Uranium Mines.—Pronto Uranium Mines Limited, operating under the management of Rio Tinto in the Blind River area of Ontario, Canada, has declared its Dividend No. 4 of 60 cents per share, payable on 20th April, 1960 to shareholders registered as at 31st March, 1960.

LONDON MARKET HIGHLIGHTS

After the previous week's dreary downturn, South African Gold shares made a bright new start on Monday morning and for the next few days never looked back. This puzzled most dealers who could see no reason why the market should suddenly brighten, especially in face of the latest outbreak of rioting in Durban which was the subject of very full coverage in the weekend Press.

It was only on Wednesday afternoon when prices began to soften that the reason for the earlier ebullience emerged. It seems that at the beginning of the week there had been some "very substantial" buying orders placed for shares—believed to have included Western Holdings, President Brand and Anglo American Corporation—by one of the investment trusts. But after their completion, the market sat back and waited for a new tonic.

Previously one of the best spots had been in Free State Geduld which under the influence of continued U.S. buying, jumped ahead 8s. 1½d. to 191s. 3d. before easing to 188s. 9d. Western Holdings at 183s. 1½d. held most of the earlier gains and "Offsits" stayed fairly firm at 112s. in front of their final dividend announcement.

Feature of the Diamond group was the strong London investment buying of De Beers, the shares rising several shillings to 195s.; estimates of the final due in March ranged up to 8s. 6d. (making a total of 13s. 6d.) and there was also talk of a possible share bonus.

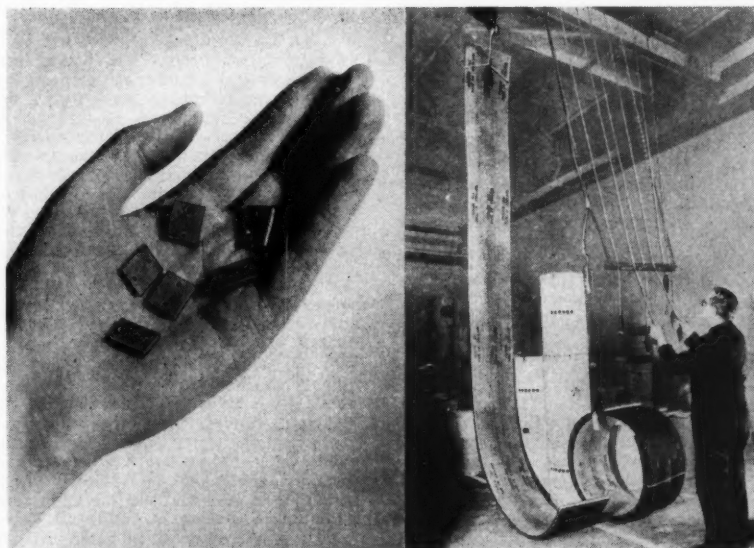
Platinums continued to be helped by the previous week's metal price increase. Potgietersrust rose to 11s. and gains were also seen in Waterval at 17s. and Unions at 16s. 3d.

Meanwhile the copper share market was torn between two competing factors. On the one hand there was the strength of the metal price which touched a three-year high as a result of continued difficulties in settling the remaining U.S. strikes and a consequent tight metal supply position in London. On the other hand, Wall Street persisted in its easier tendency despite the strong recovery in London share markets and the New York view that it was high time for Wall Street to follow suit.

Finally the soaring copper price won the day and all the Rhodesian coppers forged ahead in price. Rhokana climbed back to 74s. 6d. again and Nchanga were notably firm at 75s. 6d. Chartered rose to 116s. 6d., being additionally helped by the imminence of what can only be an excellent December quarterly income report with a higher final dividend to follow.

Tin shares moved quietly ahead after a rather slow start to the week. The more shrewd investors noted that the metal price had actually risen in the past month, despite the sharp increase in permitted tin export quotas allotted to the mines for this quarter. Another, and more obvious, demonstration of the growing prosperity of tin companies these days was the steady stream of increased interim dividends that crept daily into the financial columns.

Besides producing brake linings for everything on wheels, Ferodo Ltd., makes friction materials for anything else that is stopped by a brake. The smallest Ferodo linings in current production (left) are brake pads for domestic spin dryers. They measure ½ in. (16 mm.) x ½ in. (12.5 mm.) x ¼ in. (3 mm.) thick. In contrast the longest brake lining currently in manufacture by the company (right) is 81,600 times bigger and has a surface area 10,200 times that of the spin dryer pad. With a length of 16-ft. 7 in. (5 m.) a width of 16 in. (400 mm.) and a thickness of 1 in. (25 mm.) this outside woven lining was recently produced for a colliery winder brake.



MINING MISCELLANY

Three Russian experts have arrived at Accra to examine the possibilities of setting up an iron and steel mill in Ghana. Their first task will be to carry out a geological survey in Northern Ghana, where deposits of high-grade iron ore are known to exist in good quantities.

★

Mr. Howard Green, Canadian Minister for External Affairs, announced in the Canadian Parliament recently that Canada is to give India \$7,000,000 worth of wheat and \$11,500,000 worth of aluminium, copper and nickel under the Colombo Plan for economic aid to South and Southeast Asia. Mr. Green said that India had requested \$25,000,000 worth of Canadian commodities and equipment for its next five-year plan, and other items to be shipped by Canada would include a further \$700,000 for an atomic reactor and \$120,000 worth of raw asbestos.

★

It is reported from Salisbury that the Southern Rhodesian Government has given special permission for a detailed survey of a square mile in the area of the Khami Dam, to find out whether copper deposits were worth developing. The area, known as the Levron Block, was first pegged nearly 40 years ago, but hitherto only operated on a small scale, and abandoned in the 1930s. The survey would probably take a year to complete, and its geophysicist Mr. H. Fletcher, has had talks with a Japanese company about financing a drilling campaign in the block.

★

It was officially announced in Luxembourg by the High Authority that pithead stocks of coal in the European Coal and Steel Community fell by more than a million tons during December, 1959, the biggest fall in any single month since the start of Western Europe's glut at the end of 1957. Stocks at the end of December, 1959, totalled 31,270,000 tons against the revised figure of 32,406,000 a month earlier, and 24,538,000 at the end of 1958.

★

It was recently reported from Vienna that Hungary plans to increase her pig-iron output in the country's main ore-smelting plants by 500,000 tonnes. Modernization plans for Hungary's blast furnaces and plans for intensifying ore processing activity are planned to achieve this increase. Hungary's steel production is to be raised by increasing plant capacity at Siemens-Martin works. The giant steel and metals combine at Csepel and the Ozd steelworks are to be improved, and become centres for the Hungarian expansion in ferrous output under the terms of the five-year plan, envisaged from 1961-1965.

★

According to a recent Finnish bank review, mining and quarrying production in Finland had, by the middle of 1959, increased by 46 per cent over the 1954 output level. Metals production had increased by 13 per cent. Asbestos fibre and feldspar were among Finland's mineral exports during 1959.

The diamond fields of the Yakutalmaz Trust, in Eastern Siberia, increased diamond output more than two and a half times, compared with 1958 production, it is claimed. A 30 per cent increase is expected this year. The first Soviet floating diamond dredge will be put into service shortly at Mirny, the centre of the Soviet diamond industry.

★

According to a report from Burma, the Defence Services Institute in Rangoon is to enter a partnership with an Israeli company to mine and prospect for coal in that country. The new firm, called United Coal Suppliers Central Commercial Co., will be owned on a 55-45 basis by the Institute and the Israel Coal Co.

★

The Colombian Mining Corporation signed a contract with the government of Colombia in December last, undertaking the exploitation of the coal mines at El Cerrejon and Palmito. An initial amount of U.S.\$20,000,000 will be invested in the project and a special port for shipment of the coal will be constructed possibly at Punta Pedregal, on the Atlantic coast.

★

A uranium mine, La Primera, situated in Rahueco, in the Province of Neuquen, Argentina, has been opened formally in the presence of officials of the National Atomic Energy Committee.

★

Official government sources state that Bulgaria's lead output for the first nine months of 1959 exceeded 1958's total production figure. January-September, 1959, production was 27,000 tonnes, while 1958 total output amounted to 26,000 tonnes. Increase is planned of lead, zinc and copper in Bulgaria, and a new lead-zinc plant at Plovdiv is under construction.

★

Associated Management Co., Inc., who own and operate the Santa Ines iron mines near Manila, are planning to establish an integrated steel works on Luzon in the Philippines by the end of 1963, in partnership with Krupps. The projected steel plant would manufacture billets, structurals and other products at an initial rate of some 150,000 tons a year. Krupps to participate to a maximum 25 per cent of the Philippine firms capital structure, with Salzgitter Industrie- und Fried.Krupp Industriebau acting as consultants.

★

It is reported from Colombia that a new electrolytic zinc-smelting plant in Bogata is scheduled to begin operations soon, with a daily productive capacity of 5 tons of refined zinc. High-grade zinc ore is supplied from Junin near Bogata, while other prospective sources are the Frontino gold mines in Antioquia, where zinc is a by-product; and the Colurano uranium concession at California, Santander, where a deposit of 60,000 tons of zinc ore is reported.

The Friedrich Krupp Co. of West Germany which has been exploring for iron ore in Thailand, has discovered deposits estimated to contain 5,000,000 tons of commercially exploitable iron ore at Khao Umkrum, Kanchanaburi, and according to the survey team, other iron ore deposits are believed to exist there. Also at Kanchanaburi the Thai Department of Mines conducted a series of surveys during the first half of 1959. As a result, two relatively rich and commercially exploitable tin deposits were discovered, and the Mining Industry Organization have applied for concessions.

★

Reports from Sudan state that progress was made towards the exploitation of iron ore deposits along the Red Sea coast. Early in July, 1959, after the visit of the Yugoslav technical mission to the area, the Central Desert Mining Co. of Port Sudan and Yugometal of Yugoslavia entered into an agreement whereby mining equipment is to be supplied to the Sudanese company on easy credit terms, Yugometal having the option to purchase up to 70 per cent of the total iron ore production.

★

Dr. Cesar Dondoli, chief of the Geological Section of the Ministry of Agriculture and Industries of Costa Rica, reported the presence of large deposits of magnetite and ilmenite, so far not being worked, on the east coast of Costa Rica, particularly in the Puerto Viego area of Limon province. Mr. Paul W. Jastrow, who controls Caribbean Ore Processing Ltd., stated that the company had exploitation rights for 72 claims, totalling 288 hectares for extracting these ores. The claims on the Atlantic Coast south of Limon between the mouth of the Estrella River and Punta Uva, are reputed to contain about 8,000,000 tonnes of ore and Mr. Jastrow claims that inland deposits in the same area contain an additional 17,000,000 tonnes of ore. Chemical analysis, according to Mr. Jastrow's report, show titanium content from 5.56 to 6.73 per cent. Several U.S. companies are reported to be interested, but no production contract has been signed.

★

A contract between the government of Guatemala and a private company, Arenas Titaniferas del Pacifico, S.A. (ARTISA) was approved by executive decree on August 21, 1959. The contract grants the company the right, under specified conditions, to work or develop the iron, titanium or other minerals in the sands along the Pacific coast of the country to within five km. of the Mexican and Salvadoran borders on a strip 695 ft. wide. The concession is valid for 25 years and may be extended for 15 more years at the option of the State; under the contract, exploitation of the area must begin within nine months of approval of the contract.

★

Production of coal in Hungary in 1959 totalled a new record figure of 25,300,000 tons. This was a 5 per cent increase on the 1958 figure.

POTGIETERSRUST PLATINUMS LIMITED
UNION PLATINUM MINING COMPANY LIMITED
WATERVAL (RUSTENBURG) PLATINUM MINING COMPANY, LIMITED

(Each incorporated in the Union of South Africa)

The Boards of Directors of the above-named companies draw attention to a statement by the Chairman of Rustenburg Platinum Mines Limited, the text of which is published below.

January 28, 1960.

RUSTENBURG PLATINUM MINES LIMITED

(Incorporated in the Union of South Africa)

STATEMENT TO MEMBERS BY THE CHAIRMAN, Mr. D. A. B. WATSON, on the Directors' report and accounts for the year ended August 31, 1959.

(Issued to Members of Rustenburg Platinum Mines Limited prior to the Twenty-eighth annual general meeting to be held in the Board Room, Consolidated Building, corner Fox and Harrison Streets, Johannesburg, on Thursday, February 4, 1960, at 9.15 a.m.)

The Financial Year ended August 31, 1959

An improvement in trading conditions during the past financial year resulted in increased profits as compared with the previous year, and it is gratifying to record that the sound financial position achieved by August 31, 1959, has enabled the company to resume the payment of dividends.

At the Annual General Meeting a year ago, members were informed that if sales remained at the then indicated level and if there was no further material reduction in the official price of the metal which, at that time, was £19 10s. per ounce, then it seemed likely that the results of operations for the year would yield sufficient profit to extinguish the company's financial deficit and leave some surplus in hand.

Within a week or two of that meeting, however, the platinum market experienced a rapid and material change. Russian sales in the open market were suddenly restricted and at the same time the free market price of the metal rose sharply. By March 6 the official price had been advanced in three quick stages to £28 10s. per ounce, at which figure it remained unchanged for the remainder of the financial year.

As a consequence of this increase in price, and of some improvement on the anticipated volume of sales for the remainder of the year, the surplus funds at the year-end were substantially greater than had appeared likely at the time of the last Annual General Meeting.

Despite the satisfactory increase in the official market price of platinum during the second half of the year, the average price of £24 13s. 3d. per ounce for the whole year was still appreciably less than the figure of £27 15s. for the preceding year. The improved volume of sales of platinum during the year and the satisfactory level of sales of by-product metals more than offset this lower average price, however, and net revenue from sales increased to £2,074,642 compared with £1,518,978 for the year ended August 31, 1958. It

should be noted that these particular figures are the true measure of the improvement in the results of trading operations for the past year, prior to adjustment of the Stock Realization Reserve.

Stocks of metals, which at August 31, 1958, were excessive in relation to the level of sales at that time, have since been materially reduced. This depletion of stocks meant in effect that, of the cost of producing the metals which were sold during the year ended August 31, 1959, a significant portion had been incurred and provided for during preceding years. The amount involved was £1,084,823 and this sum, representing the book cost of production of the quantity of metals by which stocks had been reduced, was transferred from the Stock Realization Reserve to the Profit and Loss Account. It is of interest to note that, by contrast, an amount of nearly £1½m. was transferred from profits to the Stock Realization Reserve during the preceding two years, being the cost of production of metals in excess of the volume of sales during that period.

After the above-mentioned transfer of approximately £1m. from the Stock Realization Reserve to the Profit and Loss Account and after minor adjustments to the General Reserve and the receipt of a refund of the loan portion of normal tax for 1953, the amount available for appropriation at August 31, 1959, was £3,036,020. Of this sum, £94,516 was absorbed in meeting an outstanding liability under the Pneumoconiosis Act, and £1,006,168 was appropriated to finance the net expenditure on mining assets, trade investments and capital stores prior to August 31, 1959. In considering the question of the dividend payment for the year, the Board decided that a suitable amount should be retained from profits to provide, *inter alia*, some part of the future cost of replacing the stocks of metals which had been depleted during the year, and of maintaining such stocks at suitable levels. An amount of £795,299 was therefore retained and the balance of £1,140,037 was paid in dividends at the rate of 26s. 3d. per share.

Production by Rustenburg Platinum Mines Limited

Production policy is dictated both by the volume of sales being effected and by the need to maintain stocks of refined platinum at a desired level.

In deciding upon the appropriate level at which stocks should be maintained, various factors have to be considered. In the first place purchases from the company tend to fluctuate as the result of bulk purchases from time to time by industrial consumers for installations of a capital nature.

Secondly, it is desirable to maintain adequate stocks in respect of individual items of the wide variety of manufactured and semi-manufactured forms in which platinum is sold, in order that demands from consumers for particular articles may be met promptly.

Thirdly, adequate stocks of metal as such should be kept available to meet possible demands which may arise from the emergence of new uses.

A fourth factor to be provided for is the possibility of periodical and sudden restrictions in the supply of platinum from other sources, with a consequent surge of demand upon the resources of this company.

For these four main reasons, it is considered essential in the overall long term interests of the Company to maintain reasonably large stocks of refined metal. The rate of build-up or depletion of such stocks is naturally dictated by circumstances which vary from time to time. Since the commencement of the current financial year production at both mines has been increased to a combined rate which is in excess of the present average level of sales, in order that stocks of refined platinum may build up to suitable levels.

The rate of production will continue to be adjusted in the light of estimates of changes in the situation from time to time. The Waterval reduction plant, completed in 1957 and not as yet commissioned, is fully maintained and is available for immediate use, while the output from the two mines operated by the company is capable of further ex-

pansion at short notice as and when required to meet the full capacity of the reduction plants.

Demand for Platinum

During the first twenty-five years of the present century, the jewellery and allied trades were the major users of platinum. Expansion of production in the early 1930's, however, provided the necessary encouragement to industry to make use of the metal for its many valuable physical properties and, since then, consumption by industry has steadily increased both in quantity and in the variety of uses. During the last decade by far the major part of platinum production has been absorbed by the chemical industry in its various forms, including notably oil refining, with the electrical industry as the second largest consumer.

During recent years there have been violent fluctuations in world consumption, firstly upwards as a result largely of the development and adoption of the platinum catalyst by the oil refining industry and, secondly, downwards as a result of overstocking by the oil refining industry coupled with the industrial recession in the U.S.A. and in Europe during 1957 and 1958. Underlying these fluctuations, the demand for platinum by industry has remained basically sound and has shown a tendency to rise slowly as a consequence of the increasing degree of industrialization throughout the world and, to a lesser extent as a result of the development of new applications of the metal which emerge and are developed from time to time. A gradual rising trend of consumption by industry is, in my opinion, likely to continue irrespective of the possible re-entry of the oil industry as a significant consumer at some future date.

The adoption by the oil industry, in the early 1950's, of a platinum catalyst for the production of high-octane petrol resulted, as is well known, in very considerable purchases of the metal by that industry during the period 1953 to 1956 for installation in existing refineries. As in the case of other industries, there is a continuing expansion of the oil refining industry, but the quantity of new platinum required for installation in new plant, and for replacements, is at present relatively small and is being met partly from stocks in the hands of the oil refining industry. Research carried out by that industry into the use of catalysts is naturally concerned with both the economics and the efficiency of the upgrading process, and over the past few years developments have tended to extend the life of the platinum catalyst with a consequential reduction in requirements both for capital installation and for the replacement of metal lost in the process. The demands of the oil industry for platinum from this company during the past twelve months were not of major significance, nor are they at the present time, and if and when the oil industry requires platinum, this demand will on the whole tend to be additional to that now being met by Rustenburg.

Very little is known of the rate or trend of consumption of platinum in the U.S.S.R. and her satellite countries. During the past year or so Russia has announced that it is intended to increase considerably the capacity of her chemi-

cal industry and also to increase the output of high-octane petrol. This should have some effect upon platinum consumption in the U.S.S.R., but the extent of this effect cannot be assessed.

Summarizing therefore, basic demand for platinum in industry, other than oil refining, is reasonably stable and has, over past years, shown a tendency to increase gradually but satisfactorily. This may be expected to continue, although not necessarily at an even pace, whilst there may also be some improvement in the offtake by the oil industry in due course as stocks currently held by that industry are depleted. Consumption in Russia and the Russian bloc is, on the whole, likely to rise with the expanding industrialization of those countries.

Supplies of Platinum

Taken over the whole year, the quantity of platinum made available from all sources appears to have been sufficient to meet market requirements, notwithstanding the sharp reduction in the quantity of Russian platinum exported during the year.

Russia has certain trade agreements with various European countries which involve platinum and she has during the past twelve months been supplying to these and to other customers to some degree. The amount made available for export from Russia depends on the level of production and on the level of domestic consumption, both of which are difficult to assess, and appears also to depend to some extent upon her overall export policy from time to time. It is not possible to say whether the reduction in exports of platinum and palladium during the past year is, or is not, of a temporary nature.

During the calendar year 1958 Canadian output was materially reduced, firstly by the voluntary curtailment of nickel production at the mines of the International Nickel Company and then by strikes at those mines during the last quarter of the year. Production recommenced in January, 1959, on a limited scale, but was shortly afterwards brought up to full capacity. The International Nickel Company plans to increase nickel production during the years 1960 and 1961 by the opening of a new nickel mine in the Lake Manitoba district. This may result in some increase in output of platinum group metals from the International Nickel Company, but it is expected that, proportionately, this increase will be materially less than the increase in nickel production, and the increase will probably not be of marked significance in relation to world supplies.

Apart from this production of platinum as a by-product of nickel mining, the total output of platinum in the Free World by primary producers other than this country is relatively small. It is probable that the higher price levels of 1959 have encouraged these operators to produce to the capacity of their equipment, but their total output cannot contribute significantly to the stability of platinum supplies, nor can it materially effect price movements.

Of the major producers in the Free World, this company alone is in a position to vary its output to suit the circumstances of the market from time to time, and, as mentioned earlier, several up-

ward adjustments to the rate of production have been made during the past twelve months in order to ensure that adequate stocks of platinum are available.

Production and Trading Policy

The joint production and trading policy followed by ourselves and our sole refining and marketing agents, Johnson, Matthey & Co., Limited, has been stated on previous occasions, but it may well be repeated at this juncture.

Our joint policy is directed mainly to one end, namely to encourage and to foster the wider and continuing use of platinum. To achieve this object, we consider it necessary to ensure that stocks of platinum in all its various fabricated and semi-fabricated forms are adequate to satisfy the needs of industrialists as and when these needs arise, and to ensure that we have facilities available at the mines of this company and at the refineries to increase the output of platinum if this should be required. The ability to produce additional quantities of platinum is an assurance to those industrialists who are actual or potential users of the metal that they will not at some later stage be faced with difficulties in obtaining their requirements and with violent price movements arising from such difficulties.

Stocks of metal both refined and unrefined remain the property of, and are financed by, this company, while the cost of fabrication of a portion of these stocks in forms required by consumers is financed by Johnson, Matthey & Co., Limited. Furthermore, the cost of providing adequate facilities for increased production both at this company's mines and in the refineries of Johnson Matthey has been borne by this company and Johnson Matthey respectively, and the substantial amounts provided for these purposes provide ample evidence of our joint determination to meet, to the best of our ability, the first requirement for the wider use of platinum, namely that it shall in all its forms be in continuous and secure supply.

Linked with the question of supply is the question of price. The price of platinum is naturally subject to the changing stresses of supply and demand, and must therefore be expected to vary from time to time. The interests of both the platinum industry and those who use the metal are, however, best served, in our opinion, by maintaining reasonably stable prices at levels which will ensure continuity of supply. This opinion is shared by our colleagues, Johnson, Matthey & Co., Limited, and forms the basis of our joint pricing policy, which is to endeavour to maintain, in so far as may be possible, a price which is not liable to wide and sudden fluctuations.

In this connection, I stated last year that the then price of £19 10s. was, in my opinion, unrealistically low when considered in relation to the capital employed in the production and refining of platinum and the financing of the necessary pipeline and trading stocks of metal, and I also stated that I thought it was such as to be likely in due course to discourage a continuance of the free flow of platinum on to the world markets. It would seem that events substantiated this view and that the competitive price cutting which occurred during 1957 and 1958 led ultimately to a situation in

which supplies from certain sources were curtailed.

We have, I think, made it clear that in similar circumstances of price cutting we would again take steps to remain in a fully competitive position. At the other end of the scale I have indicated above that, in so far as it rests in our power so to do, we shall endeavour to secure a supply of metal to the market in quantities sufficient to modify and control excessive price increases occasioned by periodical and undue shortages of platinum.

Given sufficient sources of supply and reasonably stable prices, it is essential that adequate research be carried out on the usage of the platinum group metals and that this research and such developments as may arise therefrom be brought to the notice of potential or existing users. To this end, Johnson, Matthey & Co., Limited, maintain at Wembley near London a large research department which has for many years been actively engaged upon research into the whole field of the use of the platinum group metals. This research continues and Johnson Matthey regularly publish and circulate literature on the latest developments in regard to such metals and on patent matters. As is well known, Johnson Matthey, with whom this company has a long-standing and close association based on continuous consultation between the two companies, are not only refiners of the platinum group metals but have for many years specialized, in particular, in the fabrication of these metals into the wide variety of forms required by industry, and since the early 1800's, have continuously occupied a most prominent position in that field.

Future Outlook

Sales by the company are naturally subject to the measure of world demand which, as stated above, should, in our opinion, show a continuing although not necessarily even increase. To a much greater degree, however, our sales are affected by the availability of supplies at competitive prices from other sources, and the quantity of metal which may from time to time be made available from these sources is, unfortunately, unpredictable. Although events during the calendar year 1959 suggested that Russia might no longer wish to force excessive quantities of platinum upon an unwilling market at unrealistic price levels and, additionally, might wish to safeguard her present and future domestic requirements, I am not prepared to make any forecasts of future market conditions based upon the assumption that her policy in 1959 is necessarily an indication of the future.

I can therefore do no more at this stage than state that, given a continuance of the trading conditions which have been experienced by Rustenburg during the first five months of the current financial year, then the volume of sales for the whole year is likely to be at least of the same order as that achieved during the year ended August 31, 1959. With regard to price, it is not possible at this stage to forecast the possible changes in market conditions and the influence which they may have on price movements during the remainder of the year. However, if the price is maintained at about the current level, the average price of the metal for the year will clearly be

appreciably in excess of last year's average of £24 13s. 3d.

As regards the financial year to date, the price of platinum, which at the beginning of the year was £28 10s. per ounce, was increased on January 21, 1960, to £30 5s. whilst, in addition, the prices of rhodium and palladium have also been raised since the date of the Directors' Report.

If, as presently anticipated, sales are at least of the same order as last year and if the prices of platinum and the associated metals do not fall substantially below present levels, net revenue from the sale of metals during the year will show an appreciable improvement on last year's figure.

The attention of members is drawn to three main factors which will affect the balance of net profits available for dividends for the current year. They are:

- (a) tax liability,
- (b) the cost of building up stocks, and
- (c) capital expenditure.

The amount of the redemption allowance in respect of past and current capital expenditure which will be available as a set off against profits for the purpose of taxation in the Union of South Africa for the current financial year is likely to be of the order of £900,000 as compared with last year's allowance of £1,300,000. This reduction in the redemption allowance, if profits during the current year were at the same rate as last year, would result in an increase in the effective rate of taxation from 13% last year to 19% this year.

The cost of building up stocks during the year is dependent upon the extent to which total production, which has been geared to exceed estimated sales, will in fact exceed total sales, but it is expected that it will be considerable. Part of the cost will, it is anticipated, be

met by appropriation from the amount of £795,000 retained out of last year's profits, while some part will be met by appropriations from profits earned during the current financial year.

It is considered that during the current year and in future years capital expenditure will be incurred upon items necessary to maintain the present potential rate of production, including the provision of additional shaft facilities to serve extended working areas. It is estimated that capital expenditure during the current year may be of the order of £200,000.

Interim Dividend

With the exception of the last two years, it has been the practice of this company since 1952 to pay an interim dividend, and during March, 1960, consideration will be given to the matter. Present indications are that this past practice will be resumed.

Directorate

On December 31, 1959, Mr. P. S. Hammond resigned his seat on the Board. I would like to express our appreciation of the valuable services which he rendered to the company. On January 1, 1960, Dr. W. J. Busschau was appointed to fill the vacancy and Mr. J. M. M. Ewing was appointed as his alternate.

Staff

I would like to express our appreciation of the excellent services rendered by the Managers and the employees on the two mines and by the technical and secretarial staffs at the Head Office.

D. A. B. WATSON,
Chairman.

Johannesburg,

January 28, 1960.

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TANGANYIKA CONCESSIONS LIMITED

CAPTAIN CHARLES WATERHOUSE'S REVIEW

The Annual General Meeting of Tanganyika Concessions Limited was held on January 21, 1960, at the Head Office of the Company, Tanganyika House, Salisbury, Southern Rhodesia, **Captain The Right Honourable Charles Waterhouse, M.C., D.L.**, the Chairman, presiding.

The Chairman addressed the Meeting as follows:

"The financial year which ended on July 31, 1959, showed a profit, after taxation, of £3,293,993, a slight fall as compared with the £3,446,103 earned in the year to July 31, 1958. Last year you confirmed the recommendation of the Board that a final dividend of 2/3d. should be paid, 6d. of which was taken out of certain revenue reserves of the Company which had borne United Kingdom tax. Although no such agreeable nest egg is available this year, the Board recommends that the final dividend shall again be 2/3d. making, with the Interim Dividend of 1/6d. paid last June, the same total as last year, 3/9d.

You will remember that the ordinary stock capital of the Company was doubled by means of a bonus issue in 1958.

Copper Price

"The improvement in the copper market during the financial year has been well maintained in recent months. The highest price quoted on the London Market since the end of July was £266 10s. on November 10, the lowest £224 10s. on September 21. The average for 1959 was £237 16s. 8d. and on December 31, 1959, the price was £255 10s. per long ton as compared with £225 on July 31 quoted in my review. World markets have, however, been affected by the strikes in the United States steel industry and in copper mines on that side of the world, and consequently 1959 prices cannot be taken as a safe pointer to the price level for 1960.

"In accordance with the present policy of the Union Minière to pay interim dividends at a fixed rate, we have just received payment of 600 Belgian francs per part sociale on account of its financial year ending December 31, 1959. It is reasonable to hope that, when the figures for that year are prepared, the Directors of that Company may find it possible somewhat to increase the amount of the final distribution.

"In November, 1959, I visited the Katanga as a guest of the Union Minière. I was much impressed by the great developments of the past two years in opencast mining operations and in the progress of new plants, now nearing completion, for handling and for treating ores. The morale of the staff, both European and African, is clearly of the highest. The advantages of ever improving methods of production and treatment are being shared with the workers. Earnings are increasing and succeeding years show a steady improvement in the conditions of work and of living and in facilities for the enjoyment of leisure.

"The production of copper estimated in my review at 270,000 metric tons for the year 1959 has been exceeded and an all time record production of 280,000

metric tons achieved. It is understood that the plans for 1960 envisage some further expansion, which must, however, as always be dependent on the absorptive capacity of world markets.

The Benguela Railway Company

"On the Benguela Railway the difficult conditions prevailing in 1958, to which I referred in my last year's report, continued in the first half of 1959. Thereafter a marked improvement took place. Traffic arising in Angola, both minerals and agricultural products, showed a healthy revival. Mineral traffic from the Belgian Congo, manganese ore, copper and zinc, materially increased in volume.

"The line has again carried a considerable tonnage of copper from Northern Rhodesia to the West coast port of Lobito. At the same time a large tonnage of copper from the Union Minière mines and works in the Belgian Congo has been moved south over the Rhodesia Railways system to the East coast port of Beira. This interchange of traffic has the useful effect of keeping alternative transport routes open to both the great Central African copper producing areas.

"Better metal prices resulted in better freight rates. The fall in the net revenue of the earlier months was more than recovered and results for the year 1959 are expected to show a small but encouraging improvement on 1958.

"Towards the end of 1959 I returned to Africa, landing at Lobito. I was much struck by the great improvements recently carried out by the Harbour Authority in the port itself and saw the newly completed ore handling plant in operational trials. My journey on the Railway across Angola enables me to give a most favourable report on the condition of the track, which is now ballasted in stone throughout almost the whole of its length, on the high state of efficiency of the rolling stock, and on the fine equipment of workshops and repair depots.

"Throughout the whole system the staff of the Railway from the General Manager, Engineer Augusto Bandeira, to the last joined African recruit, have shown the finest possible spirit in meeting the exceptional demands which the rapid expansion of traffic during the last four or five months has imposed upon them.

Important Developments

"As mentioned in my review, your Company, through its wholly owned subsidiary, Tanganyika Properties (Rhodesia) Limited, has increased its participation in Border Forests (Rhodesia) Limited, a company which owns extensive conifer forests on the eastern boundary of Southern Rhodesia. The newly erected sawmill, equipped with the most up-to-date machinery having an initial capacity of 1½ million cubic feet of logs per annum, is now in operation.

"An opportunity arose for Tanganyika Concessions to acquire a controlling interest in Boxes & Shooks Ltd., Saw Millers, Box Manufacturers and Timber Merchants, and their subsidiary company, Novobord Ltd., manufacturers of particle board. The main works of the

group are in and around Port Elizabeth in the Union of South Africa. The parent company and its subsidiary have had a satisfactory profit record over a number of years.

"We have signed an Agreement with the owners of the group, under which it is proposed to register in Salisbury a new company, Commonwealth Timber Industries Limited, with an authorized capital of £24 million. Tanganyika Concessions will take up 60% of the initial issued capital and the vendors will hold the remaining 40%. The object of the company is to acquire the whole of the issued capital of Boxes & Shooks Ltd. and to finance and organize the manufacture of the Novopan type of particle board and a new type of box wood in the British Commonwealth. The Managing Directors of Boxes & Shooks have agreed to enter into long term contracts of service with that company so that a continuance of the present expert and successful management is assured.

"Work has continued in prospecting the area in Northern Rhodesia in which Tanganyika Holdings Limited is associated with the Rio Tinto Group, and in that east of Lake Tanganyika, which is being conducted by the Anglo American Corporation of South Africa Ltd. and in which Tanganyika Properties (Rhodesia) Limited has a share. No fresh discoveries have been made in the former and nothing of economic value has as yet been disclosed in the latter area.

"On behalf of the Board and the Shareholders of Tanks I take this opportunity of thanking the staffs, both of this Company and of its associates, for their work during the year."

The Report and Accounts were adopted, the payment of the final dividend was approved and the retiring Directors were re-elected.

BOARD CHANGES

Mr. W. Watson Connor has been appointed a director of the Yukon Consolidated Gold Corporation in succession to Mr. A. M. Baer, who has resigned.

★

Sir Ronald Prain has been appointed a director of the Monks Investment Trust. Sir Ronald is chairman of the Rhodesian Selection Trust, and a director of the International Nickel Co. of Canada.

★

Mr. P. S. Hammond has resigned his seat on the board of directors of General Exploration Orange Free State, Ltd., and Mr. J. M. M. Ewing has been appointed a director of the company to fill the vacancy thus created.

★

Mr. P. H. Anderson and Mr. H. C. Koch have been appointed directors of Bracken Mines.

★

Mr. W. J. Busschau has been appointed a director of Blyvooruitzicht Gold Mining Co., in the place of Mr. P. S. Hammond who has resigned.

★

Mr. A. H. Ball, Mr. H. C. Koch and Mr. T. Reekie have been appointed directors of Leslie Gold Mines.

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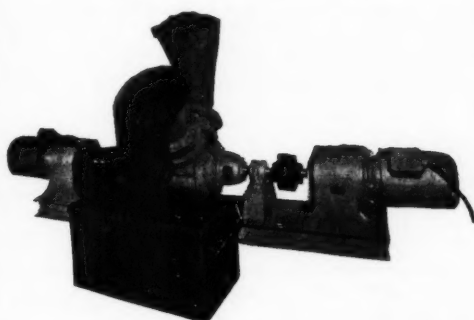
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NEW BRITISH TUNNELLING RECORD

By advancing 107 yd. 4 in. in seven days, a team of 24 National Coal Board tunnellers have set up a new British tunnel drive record. This was accomplished in the week ending December 14 at the Bank Hall Colliery, Burnley, in the North-Western Division of the N.C.B.

The previous seven-day record was 105 yd. 6 in. of tunnelling driven and completed at the Agecroft colliery, Pendlebury, near Manchester, during the week ending August 30, 1959.

The Towneley tunnel at Bank Hall, in which the new record was established, has a sectional area of 21.5 sq. yd. and is 1,500 ft. below ground, rising 1 in 200 and is situated about 5,000 ft. from the shaft. The tunnel was driven through shale, sandstone beds and cannel, about 4,700 tons of debris being removed from the pit in this week in addition to an output of 7,213 tons of coal.

The drive was carried out by six face men per shift, using six Holman (Silver Three) drilling machines equipped with Padley and Venables 10 ft. drills and tungsten carbide tipped bits.

The broken ground at the face was removed by a Distington-Goodman 50 B. tunneller. This 12-ton, 70 h.p. machine has been in service at Bank Hall colliery since June, 1957. The spoil was then loaded into 4½-ton mine cars, which are also of Distington Engineering Company's manufacture.

Coming Events

Dr. I. W. Wark, Chief of the Division of Industrial Chemistry, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, will deliver the Fifth Sir Julius Wernher Memorial Lecture of the Institution of Mining and Metallurgy on April 6 next—the evening preceding the opening of the International Mineral Processing Congress. Dr. Wark has chosen as his subject the exploitation of minerals for mankind. The lecture will be given at 5 p.m. in the Assembly Hall of Church House, Westminster, London, S.W.1.

The Second International Trade Fair of engineering products will be held in Brno, Czechoslovakia, from September 11 to 25, 1960. The Brno Fair has been arranged to follow immediately after the Leipzig Fair of consumer commodities, while its second week will coincide with the beginning of the trade fair at Plovdiv, Bulgaria, which commences on September 18, thus enabling visitors to cover the three fairs, in the shortest possible time.

As a result of the report to the Council by the three-man delegation of the Scientific Instrument Manufacturers' Association of Great Britain (SIMA), which went to Moscow last November, SIMA is to hold an exhibition of British Scientific Instruments in Moscow June 16-26 next. This exhibition will be the first to be held in Russia by a British organization of manufacturers in a specialized field, and enquiries are still being received by additional exhibitors wishing to participate.

PERSONAL

Mr. J. E. C. Bailey, C.B.E., M.I.Ex., chairman and managing director of Baird and Tatlock (London), and Hopkin and Williams, is leaving next week to visit the companies' branches agents and customers in East, Central and South Africa.

A.E.I. (Rugby), formerly the British Thomson-Houston Co., announce the appointment of Mr. D. Edmundson as general manager, Rugby Works. Mr. H. E. Cos now becomes Deputy Director of Manufacture.

Captain R. A. Villiers has been appointed first director of the Scientific Instrument Manufacturers' Association of Great Britain and Mr. G. L. Knight has been appointed Assistant to the Director.

Sir David Eccles, Minister of Education has appointed Sir Harold Roxbee Cox as chairman of the National Council for Technological Awards, in succession to Lord Hives who has retired. Sir Harold has been vice-chairman of the National Council since its establishment in 1955.

Mr. Peter Hamilton has joined Fred Myers, Ltd., Caterpillar Dealer for London and Southern England, as managing director. Mr. D. R. Bowers is appointed Sales Manager of the Caterpillar Earthmoving Division. Major-General D. C. T. Swan has placed his resignation before the board, owing to private commitments.

Mr. T. D. Weatherhead, former managing director of Hunting Aero-surveys Ltd., is managing director of Hunting Surveys Ltd., and Mr. D. N. Kendall, vice-president of Hunting Associations Ltd., the controlling company for all Hunting's aviation and survey interests in Canada, is president of Hunting Survey Corporation Ltd. Mr. C. P. M. Hunting remains president of Hunting Associates Ltd., and is chairman of Hunting Surveys Ltd.

Dr. C. J. Stubblefield, F.R.S., has been appointed Director of the Geological Survey of Great Britain and Museum of Practical Geology; he will succeed Sir William Pugh, who retires on July 28.

Steel and Co., of Sunderland has made an agreement with Unit Crane and Shovel Corporation of Milwaukee, U.S.A., whereby Unit will manufacture Coles cranes in Milwaukee and market these through U.S.A., Canada and Mexico under the name of Unit-Coles and R. H. Neal and Co., will manufacture Unit cranes, excavators, draglines and backhoes in Grantham, and will market them throughout the world, excepting in U.S.A., Canada and Mexico, under the name of Neal-Unit, and subject to the existing Unit franchises in Australia, South Africa and the Benelux countries.

The following appointments have been announced following the merger of Reynolds T.I. Aluminium and the British Aluminium Co., to take effect from February. Pending completion of plans they will cover the operations of both companies. Mr. Gerald Lacey, commercial director of British Aluminium, to be executive director (forward planning); Mr. G. A. Anderson, director and general sales manager, British Aluminium, to be director of products and development; Mr. Basil James, chief executive (sales) Reynolds T.I. Aluminium, to be director of sales; Mr. J. Salter, director and general production manager, British Aluminium; Mr. Paul R. McGehee, chief executive (production) Reynolds T.I. Aluminium, to be director of production (manufactured products); Mr. W. B. C. Perrycoste, director and general production manager, British Aluminium, to be director of production (primary products).

Brigadier H. P. Crosland, chairman and managing director of Metal Traders Ltd., has been elected chairman of the Zinc Development Association for 1960. The former chairman, Mr. R. T. de Poix, will continue as a member of the Council of the Association.

The National Coal Board announce that Mr. Geoffrey Kirk has been appointed Chief Public Relations Officer, and will take over responsibility for their Public Relations Branch. Mr. Kirk has been the Board's chief Press Officer since April, 1955.

The National Coal Board announce the appointment of Mr. R. G. C. Cowe to be Secretary of the Board in succession to Mr. C. A. Roberts, whose appointment as a member of the board was announced recently. Mr. Cowe is at present Deputy Secretary of the Board.

The death occurred in an air disaster in Turkey on January 19, of Mr. Rune Lemner, manager of the marketing department of Atlas Copco AB, Stockholm.

Associated Electrical Industries have appointed Sir Arthur Elton, Bart., to be the controller of their Central Information Department. He will take up his duties on March 1.

Mr. Alex Dormer, chairman and joint managing director of The Sheffield Twist Drill and Steel Co., was appointed second vice-chairman of the Gauge and Tool Makers' Association to fill the vacancy caused by the death of Mr. H. G. Carmichael Wilson.

Mr. H. S. Barker, chairman and managing director of Parkinson Cowan Ltd., has been elected chairman designate of the British Institute of Management. He will succeed Lord Verulam at the Annual General Meeting of the Institute in October.

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LONDON METAL AND ORE PRICES, JAN. 28, 1960

METAL PRICES

Aluminium, 99.5%, £186 per ton	Manganese Metal (96%/98%) £245/£250
Antimony—	Magnesium, 2s. 2½d./2s. 3d. lb.
English (99%) delivered, 10 cwt. and over £190	Nickel, 99.5% (home trade) £600 per ton
per ton	Osmium, £21/£23 oz. nom.
Arsenic, £400 per ton	Osmiridium, nom.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Palladium, £9 7s. 6d.
Cadmium 10s. 0d. lb.	Platinum U.K. and Empire Refined £30 5s.
Cerium (99%) net, £16 0s. lb. delivered U.K.	Imported £29/£29½
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.	Quicksilver, £71½ ex-warehouse
Cobalt, 14s. lb.	Rhodium, £50 oz.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram	Ruthenium, £18/£20 oz. nom.
Gold, 250s. 6½d.	Selenium, 50s. 0d. per lb.
Iridium, £23/£25 oz. nom.	Silver, 79½d. f. oz. spot and 79½d. f'd
Lanthanum (98%/99%) 15s. per gram.	Tellurium, 21s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	19s. 6d./21s. 6d. per unit, c.i.f.
Beryl (min. 10 per cent BeO)	230s. per l. ton unit BeO
Bismuth	30% 5s. 0d. lb. c.i.f.
	20% 3s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable 48%	£15 15s. 0d. per ton c.i.f.
Hard Lumpy 45%	(Ratio 3 : 1)
Refractory 40%	£15 10s. 0d. per ton c.i.f.
Smalls 44%	(Ratio 3 : 1)
Baluchistan 48%	(Ratio 3 : 1)
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1).	£11 15s. 0d. per ton f.o.b.
	Nb ₂ O ₅ :Ta ₂ O ₅ 175s. per l. ton unit c.i.f.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF ₂)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 3½% Li ₂ O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li ₂ O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li ₂ O	£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 6½s. 6d. freight	73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO ₂ (prompt delivery)	£29 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO ₂	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	155s. 0d./160s. 0d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V ₂ O ₅	8s./8s. 11d. per lb. V ₂ O ₅ c.i.f.
Zircon Sand (Australian) 65-66% ZrO ₂	£16/£16 10s. ton c.i.f.

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